



MINERALS BY CLASS



SILICATES	HALIDES	TUNGSTATES / MOLYBDATES	ELEMENTS	PHOSPHATES/ VANADINATES/ ARSENATES
<u>agerine</u> (7)	<u>chlorargyrite</u> (4)		<u>antimony</u> (3)	
<u>analcime</u> (2)	<u>fluorite</u> (15)	<u>crocoite</u> (3)	<u>bismuth</u> (3)	<u>annabergite</u> (6)
<u>andalusite</u> (3)	<u>halite</u> (6)	<u>ferberite</u> (3)	<u>gold</u> (6)	<u>apatite</u> (6)
<u>andradite</u> (3)	<u>salammoniac</u> (4)	<u>scheelite</u> (3)	<u>silver</u> (8)	<u>autunite</u> (3)
<u>apophyllite</u> (4)		<u>wulfenite</u> (19)	<u>sulfur</u> (2)	<u>brazilianite</u> (5)
<u>augite</u> (2)				<u>carnotite</u> (3)
<u>babingtonite</u> (3)				<u>clinoclase</u> (5)
<u>benitoite</u> (3)		CARBONATES	OXIDE / HYDROXIDE	<u>collinsite</u> (3)
<u>beryl</u> (6)		<u>ankerite</u> (6)	<u>atacamite</u> (2)	<u>cornetite</u> (4)
<u>boltwoodite</u> (4)		<u>aragonite</u> (2)	<u>bixbyite</u> (5)	<u>cornubite</u> (2)
<u>cavansite</u> (3)		<u>artinite</u> (4)	<u>brookite</u> (4)	<u>eosphorite</u> (3)
<u>chrysocolla</u> (4)		<u>azurite</u> (16)	<u>cassiterite</u> (4)	<u>erythrite</u> (3)
<u>cuprosklodowskite</u> (5)		<u>bastnasite</u> (4)	<u>chalcotrichite</u> (7)	<u>francevillite</u> (3)
<u>danburite</u> (4)		<u>calcite</u> (25)	<u>chrysoberyl</u> (3)	<u>koettigite</u> (6)
<u>datolite</u> (4)		<u>cerussite</u> (3)	<u>corundum</u> (2)	<u>lazulite</u> (6)
<u>diopside</u> (8)		<u>dolomite</u> (11)	<u>cryptomelane</u> (5)	<u>legrandite</u> (4)
<u>diopase</u> (9)		<u>kutnohorite</u> (2)	<u>cuprite</u> (3)	<u>libethenite</u> (5)
<u>epidote</u> (2)		<u>magnesite</u> (5)	<u>goethite</u> (3)	<u>mimetite</u> (4)
<u>eudialyte</u> (3)		<u>malachite</u> (6)	<u>hausmannite</u> (3)	<u>olivenite</u> (4)
<u>feldspar</u> (14)		<u>rhodochrosite</u> (5)	<u>hematite</u> (15)	<u>phurcalite</u> (3)
<u>ferroAxinite</u> (4)		<u>rosasite</u> (5)	<u>latrappite</u> (3)	<u>purpurite</u> (3)
<u>grossular</u> (7)		<u>siderite</u> (6)	<u>limonite</u> (4)	<u>pyromorphite</u> (4)
<u>hemimorphite</u> (6)		<u>smithsonite</u> (13)	<u>magnetite</u> (2)	<u>roselite</u> (4)
<u>heulandite</u> (8)		<u>strontianite</u> (3)	<u>pseudobrookite</u> (6)	<u>scholzite</u> (3)
<u>hornblende</u> (3)			<u>pyrolusite</u> (6)	<u>skutterudite</u> (3)
<u>ilvaite</u> (3)		SULFOSALTS	<u>rutile</u> (11)	<u>strengite</u> (3)
<u>Inesite</u> (5)		<u>anglesite</u> (6)	<u>spinel</u> (4)	<u>svanbergite</u> (4)
<u>joaquinite</u> (3)		<u>anhvdrite</u> (3)		<u>torbernite</u> (2)
<u>kinoite</u> (3)		<u>barite</u> (8)		<u>vanadinite</u> (25)
<u>kyanite</u> (4)		<u>brochantite</u> (4)		<u>variscite</u> (4)
<u>laumontite</u> (3)		<u>creedite</u> (8)	BORATES	<u>vivianite</u> (3)
<u>mesolite</u> (3)		<u>cyanotrichite</u> (3)	<u>hilgardite</u> (4)	<u>wardite</u> (4)
<u>mica</u> (21)		<u>ettringite</u> (3)	<u>rhodizite</u> (5)	<u>wavellite</u> (3)
<u>murmanite</u> (3)		<u>glauberite</u> (2)		
<u>natrolite</u> (3)		<u>spangolite</u> (3)		


<u>neptunite</u> (6)
<u>nontronite</u> (3)
<u>okenite</u> (2)
<u>olivine</u> (3)
<u>opal</u> (18)
<u>piemontite</u> (3)
<u>prehnite</u> (2)
<u>quartz</u> (4)
<u>scolecite</u> (3)
<u>sillimanite</u> (3)
<u>spessartite</u> (2)
<u>staurolite</u> (4)
<u>stilbite</u> (5)
<u>titanite</u> (3)
<u>topaz</u> (8)
<u>tourmaline</u> (13)
<u>uranophane</u> (6)
<u>uvarovite</u> (2)
<u>uvite</u> (4)
<u>vesuvianite</u> (3)
<u>willemite</u> (2)
<u>zoisite</u> (4)

Silicates

Name:	aegirine (acmite)			
	Class:	Silicates		
	Chemistry:	Na Fe Si2O6 Sodium Iron Silicate		
	Color(s):	Dark green, black Streak: pale yellow		
	Hardness:	6	SpecGrav:	3.5 - 3.6
	Fracture:	Uneven	Cleavage:	2 good
	Crystal:	Monoclinic - often long prismatic, striated, sometimes acicular		
	Environment:	contact metamorphics		
	Association:	albite, sodalite, barite, quartz,nepheline		
	Locals:	Greenland Ak., Ca., Or., USA Africa		
	Misc:	Named for Aegir, the Scandinavian God of the sea. The acmie name is derived from the Greek "akme", meaning "point", which describes its crystal shape.		






Name:	analcime (analcite)			
Class:	Silicates			
Chemistry:	Na[AlSi2O6] * H2O hydrous sodium aluminum silicate			
Color(s):	clear, white, gray, yellow, red, green			
Hardness:	5 - 5.5	SpecGrav:	2.2 - 2.3	
Fracture:	conchoidal	Cleavage:	none	
Crystal:	Cubic (ikositetrahedrons or cubic forms common)			
Environment:	Occurs primarily in zeolite mineral groups, often in sodium rich basalts or nepheline syenites. Structurally related to "feldspathoids"			
Association:	leucite, natrolite, stilbite, apophyllite, prehnite, chlorite, calcite			
Locals:	Colorado, Michigan, New Jersey, USA Sicily, Italian Alps Tasmania Nova Scotia			
Misc:	Name is from the Greek "an alkimos" meaning "not strong", because it is weakly pyroelectric..			






Name:	andalusite		
Class:	Silicates		
Chemistry:	Al2SiO5 Aluminum Silicate		
Color(s):	red, brown, tan, olive green		
Hardness:	6.5 - 7.5	SpecGrav:	3.13 - 3.16
Fracture:	uneven	Cleavage:	perfect
Crystal:	Orthorhombic, often square in cross section with a distinguishing X in cross section		
Envronment:	low pressure metamorphic rocks low in Ca and rich in Al.		
Association:	kyanite, sillimanite, cordierite, and corundum		
Locals:	Calif., Penn., Mass. Maine, USA Brazil China Spain Italy Australia		
Misc:	The variety with the strong X-pattern is called "chiastolite", from the Greek "chastos", meaning "X-marked". The name, Andalusite, comes from the Spanish local Andalusia. It is one of three polymorphs of Aluminum Silicate, the other two being Sillimanite, and Kyanite. They are related through their pressure and temperature of formation.		






Name:	andradite (garnet)		
Class:	Silicates		
Chemistry:	$\text{Ca}_3\text{Fe}_2(\text{SiO}_4)_3$		
Color(s):	yellow, brown, red-brown, black, greenish		
Hardness:	6.5 - 7.0	SpecGrav:	3.6 - 4.1
Fracture:	Brittle	Cleavage:	None
Crystal:	Cubic - usually dodecahedrons or sometimes trapezohedrons.		
Environment:	occurs in granite pegmatites, in carbonatites, and in some contact metamorphics		
Association:	albite, biotite, calcite, wollastonite, orthoclase, hedenbergite		
Locals:	N.J., Ca., Nv., USA Canada England Geermayn		
Misc:	Named for a Brazilian Mineralogist, d ¹ Andrada Silva. Part of the garnet family of minerals and a close cousin to grossular. The green variety is sometimes called Demantoid.		




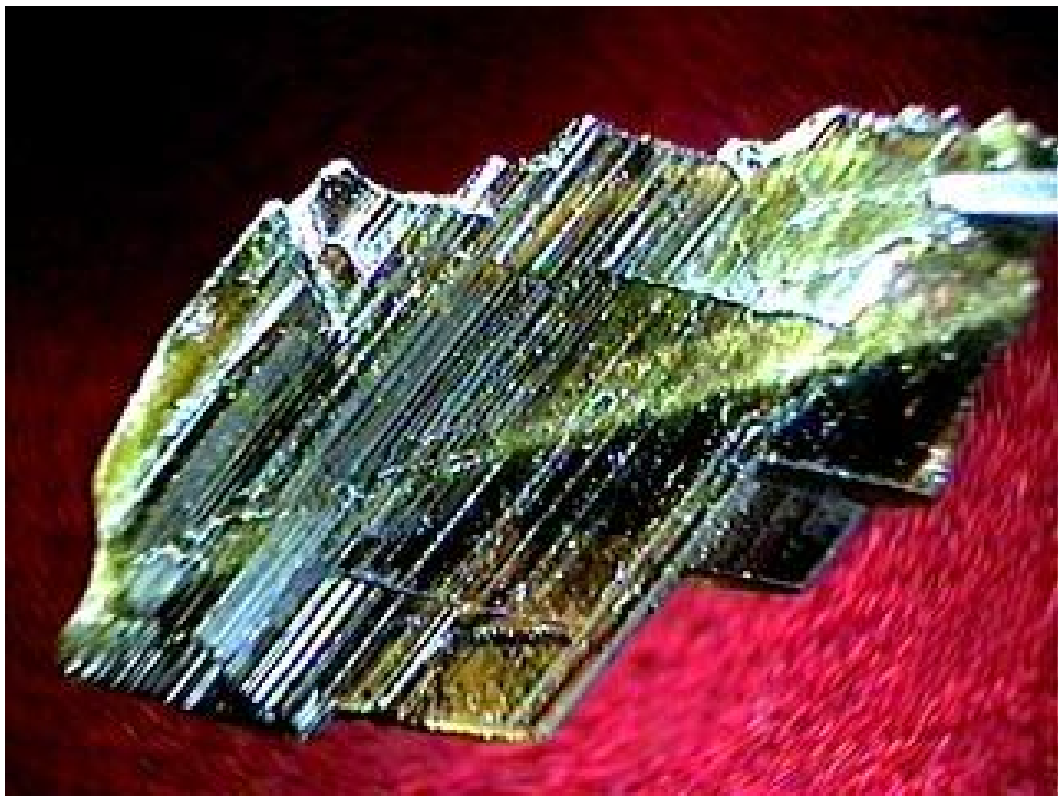


Name:	apophyllite				
	Class:	Silicates			
	Chemistry:	KCa4(Si4O10)(F)*8 H2O hydrous calcium potassium (fluoro) silicate			
	Color(s):	pale green, white, gray, reddish, clear, Streak: white			
	Hardness:	4.5 - 5.0	SpecGrav:	2.3 - 2.4	
	Fracture:	uneven	Cleavage:	perfect one direction	
	Crystal:	tetragonal (often dipyramidal) may look cubic if non terminated			
	Envronment:	cavities in basaltic rocks			
	Association:	zeolites, prehnite, stilbite, analcite, scolecite			
	Locals:	Poona/India New Jersey, Michigan/USA Mexico			
Misc:	from the Greek "apo" and "phyllon", meaning "off" - "leaf", because it flakes apart when heated in flame.				





Name:	augite			
	Class:	Silicates		
	Chemistry:	(Na,Ca,Mg,Fe2,Ti,Al)2[(AL,Si)2O6 mixed metal aluminum silicate		
	Color(s):	green, black, brown, rarely colorless		
	Hardness:	5 - 6	SpecGrav:	3.2 - 3.6
	Fracture:	conchoidal	Cleavage:	incomplete
	Crystal:	Monoclinic (often short prismatic) twinning and striations common - well formed crystals are rare.		
	Environment:	found in nepheline syenite, and some carbonates.		
	Association:	hornblende, feldspars, biotite, olivine		
	Locals:	Oregon, Colorado, New York, USA Canada Italy Greenland India Pakistan		
Misc:	Name comes from the Greek "augites", meaning "brightness" because of its bright, vitreous luster. Not affected by acids.			






Name:	babingtonite			
	Class:	Silicates		
	Chemistry:	Ca2Fe2Si5O14 OH		
	Color(s):	Black		
	Hardness:	5	SpecGrav:	3.25-3.35
	Fracture:	uneven	Cleavage:	perfect- 2 directions
	Crystal:	triclinic, thick and tabular or short and prismatic		
	Environment:	cavities and crevices in granite, and pegmatites and with zeolites in altered basalts.		
	Association:	epidote, quartz, prehnite		
	Locals:	NJ, MS, C), USA / Sweden		
	Misc:	named after the minerologist William Babington (1757-1833)		






Name:	benitoite			
	Class:	Silicates		
	Chemistry:	BaTi Si3O9 barium titanium silicate		
	Color(s):	blue, purple, pink, white, clear streak: uncolored		
	Hardness:	6 - 6.5	SpecGrav:	3.6
	Fracture:	conchoidal	Cleavage:	indistinct
	Crystal:	trigonal (pyramidal or tabular, usually flattened on c-axis and somewhat triangular in shape)		
	Environment:	Two Locals San Benito Co. Calif. and Mont. St. Hilaire, Quebec, Canada		
	Association:	neptunite, joaquinite, natrolite		
	Locals:	Calif., Texas (sand grains) , USA Belgium (sand grains)		
	Misc:	Blue fluorescence under short wave UV. Strongly dichroic. Named after the local (San Benito County) where it was first found (1907). This is the only site on earth where it has been found in place.		






(C) Chingellato Matteo 2007



Name:	beryl		
Class:	Silicates		
Chemistry:	$\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$		
Color(s):	green (emerald), blue (aquamarine), yellow (golden), pink (morganite), red, colorless		
Hardness:	7.5-8	SpecGrav:	2.66-2.92
Fracture:	uneven-conchoidal	Cleavage:	indistinct-one direction
Crystal:	hexagonal: crystals are common - usually six sided, maybe striated along lengthwise.		
Environment:	pegmatites and some metamorphic rocks.		
Association:	quartz, micas, almandine.,microcline,calcite, topaz, fluorite		
Locals:	NC, CA, NV, CO, New England, USA / Brazil / Columbia / China / Ireland/ Switzerland		
Misc:	the name come from the Greek, beryllos, indicating a green gemstone.		






Name:	boltwoodite (Nenadkevite)			
	Class:	Silicates		
	Chemistry:	$\text{KH}(\text{UO}_2)(\text{SiO}_4) \cdot 1.5 \text{H}_2\text{O}$		
	Color(s):	yellow or light yellow. Streak: white		
	Hardness:	3.5 - 4.0	SpecGrav:	3.6
	Fracture:		Cleavage:	perfect 2 directions
	Crystal:	Monoclinic - Sphenoidal		
	Environment:	alteration areas surrounding hydrated uranyl oxides; also in fractures at some distance from primary uraninite.		
	Association:			
	Locals:	Ca., Ut., USA England South Africa Namibia		
Misc:	Named after Bertram Borden Boltwood of Yale University; who devised the U-->Pb method of measuring geologic time.			






Name:	cavansite			
Class:	Silicates			
Chemistry:	Ca(VO)(Si4O10) - 4 H2O hydrated calcium vanadium silicate			
Color(s):	Blue (sometimes greenish but usually bright blue), Streak:blue			
Hardness:	3 - 4	SpecGrav:	2.3 - 2.4	
Fracture:	conchoidal	Cleavage:	perfect in one direction	
Crystal:	Orthorhombic (usually in radiating spherical clusters)			
Envronment:	usually formed in pockets in volcanic basalts			
Association:	stilbite, heulandite, apophyllite and other zeolites			
Locals:	Poona/India Oregon/USA			
Misc:	Named after its composition of calcium, vanadium, and silicon.			





Name:	chrysocolla			
	Class:	Silicates		
	Chemistry:	Cu4(OH)8(Si4O10) * n H2O hydrated copper silicate		
	Color(s):	blue, light blue, blue-green, greenish, Streak: greenish-white		
	Hardness:	2 - 4	SpecGrav:	2.0 - 2.3
	Fracture:	conchoidal	Cleavage:	none
	Crystal:	rhombic (seldom crystals, usually found amorphous, often globular)		
	Environment:	in the oxidized zone of copper deposits		
	Association:	malachite, diopside, azurite, cuprite		
	Locals:	Germany England USSR Zaire Arizona, New Mexico, Idaho/USA Mexico Chile		
Misc:	soluble in HCl, from the Greek words "chrynos" and "kolla" which mean "gold" and "glue". It was similar in color to a material used in gold soldering in ancient times.			






Name:	cuprosklodowskite		
Class:	Silicates		
Chemistry:	Cu[(UO2)(SiO2OH)]2·6(H2O)		
Color(s):	greenish-yellow, light green		
Hardness:	4.0	SpecGrav:	3.8
Fracture:		Cleavage:	good
Crystal:	triclinic: acicular to radial needles		
Environment:			
Association:	sklodowskite, diopside, uranophane,		
Locals:	Zaire England France		
Misc:	Named from its similar composition and affinity to Sklodowskite		






Name:	danburite			
	Class:	Silicates		
	Chemistry:	CaB2Si2O8 calcium borosilicate		
	Color(s):	clear, white, brown, greenish, occasionally pale yellow		
	Hardness:	7 - 7.3	SpecGrav:	2.97 - 3.02
	Fracture:	conchoidal	Cleavage:	poor
	Crystal:	Orthorhombic large crystals common, prismatic with good termination		
	Environment:	found in fissures, in Alpine crevices, contact metamorphic dolomites, and hydrothermal sulfide veins.		
	Association:	feldspar, calcite, dolomite, quartz, datolite, prehnite, pyrite		
	Locals:	Conn., New York, USA Mexico Bolivia USSR Japan Germany Switzerland		
	Misc:	Named for an original source location in Danbury Connecticut. It shows a green color in a flame test (boron), it is not particularly soluble in acids.		






Name:	datolite				
	Class:	Silicates			
	Chemistry:	CaB(SiO4)(OH) hydrous calcium borosilicate			
	Color(s):	colorless, white, yellowish, green, rarely red or gray			
	Hardness:	5 - 5.5	SpecGrav:	2.8 - 3.0	
	Fracture:	uneven, conchoidal	Cleavage:	none	
	Crystal:	monoclinic, short prismatic, thick tabular, and unusual porcelaneous nodules from Michigan			
	Environment:	Secondary mineral in basalt cavities, serpentinites, and sometimes with zeolites.			
	Association:	prehnite, apophyllite, wollastonite, diopside, copper, quartz, stilbite, heulandite			
	Locals:	New Jersey, Mich., USA Germany Italy Norway Australia USSR			
	Misc:	The name is from the Greek "dateisthai", meaning "to divide", as it often crumbles easily. Flame test is green, and it is slightly soluble in Hydrochloric acid.			





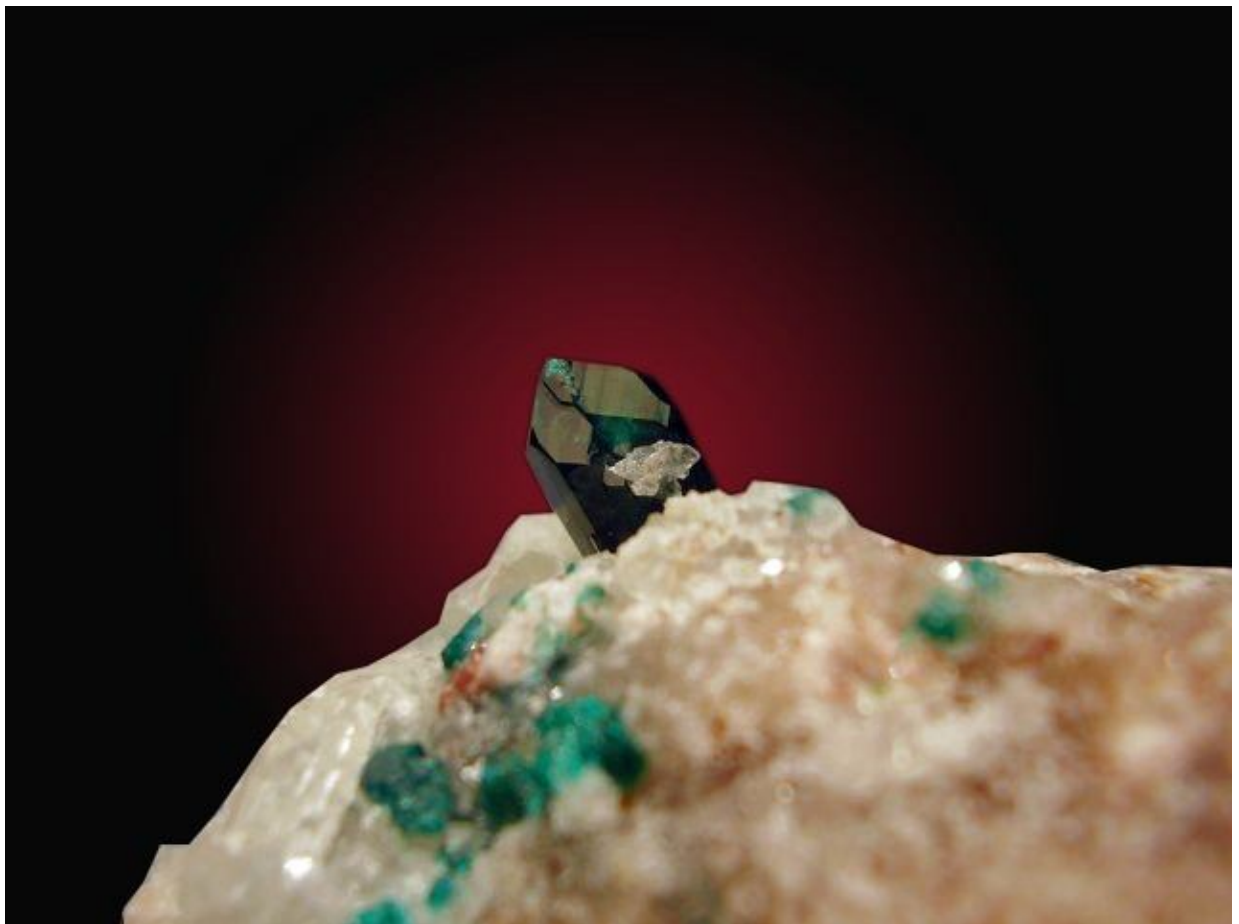
Name:	diopside		
Class:	Silicates		
Chemistry:	CaMg(Si ₂ O ₆) calcium magnesium silicate		
Color(s):	green, yellow, bronze, blue to violet, and sometimes clear.		
Hardness:	5 - 6.5	SpecGrav:	3.22 - 3.4
Fracture:	uneven	Cleavage:	complete
Crystal:	monoclinic short columnar, tabular, often twinning		
Environment:	contact metamorphics, marbles, and in calcium silicates.		
Association:	wollastonite, grossular garnets, chlorite, calcite, magnetite, mica		
Locals:	Calif., Montana, USA Sweden Canada Germany India USSR Switzerland		
Misc:	The name is from the Greek meaning "two views", referencing its two fold monoclinic symmetry. Some of the material can be cabbed to form a cats-eye stone. It is a member of the pyroxene solution series, hedenbergite CaFe(Si ₂ O ₆), johannsenite Ca(Mn,Fe)(Si ₂ O ₆) and diopside CaMg(Si ₂ O ₆).		




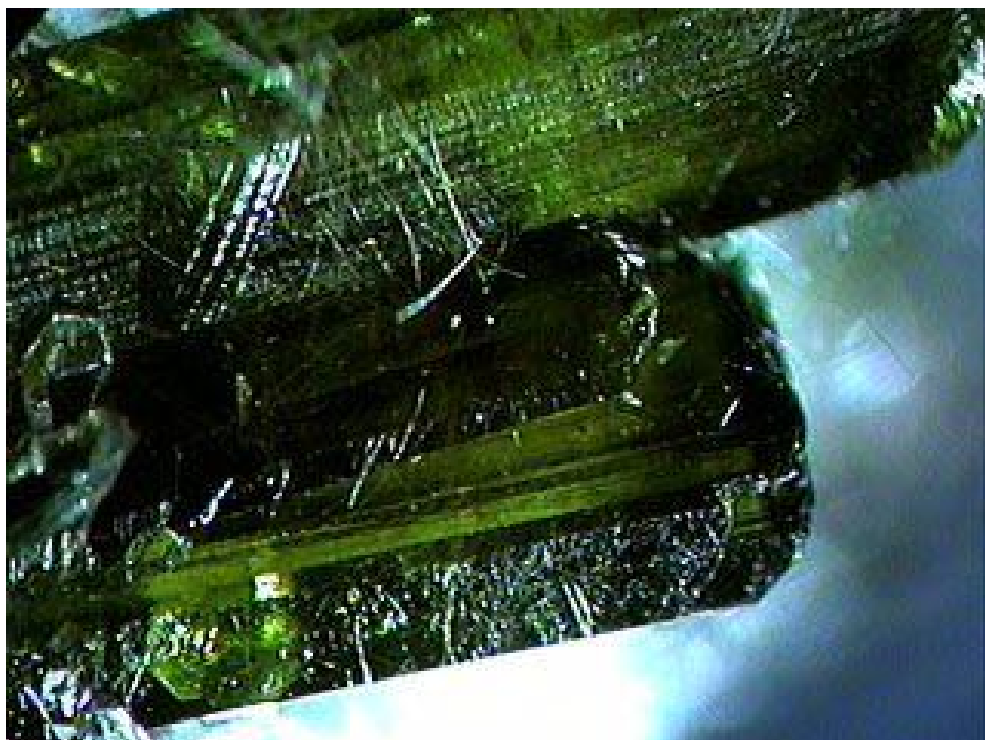


Name:	diopase				
	Class:	Silicates			
	Chemistry:	CuSiO2(OH)2 hydrous copper silicate			
	Color(s):	green, blue, deep green , Streak: green			
	Hardness:	5.0	SpecGrav:	3.28 - 3.53	
	Fracture:	conchoidal	Cleavage:	perfect in 3 directions	
	Crystal:	hexagonal (often rhombohedral)			
	Envronment:	formed in hydrothermal alteration zones			
	Association:	malachite, azurite, chrysocolla, brochanite			
	Locals:	Chile Congo Namibia Zaire USSR Arizona,California/USA			
Misc:	From the Greek "diopteia", meaning "to see through", most small crystals are transparent with many small cleavage fractures. It was first mistaken for emerald.				






Name:	epidote			
Class:	Silicates			
Chemistry:	$\text{Ca}_2(\text{Al,Fe})\text{Al}_2\text{O}(\text{SiO}_4)(\text{Si}_2\text{O}_7)(\text{OH})$ hydrous calcium iron aluminum silicate			
Color(s):	green, yellow, gray, Streak: gray			
Hardness:	6 - 7	SpecGrav:	3.25 - 3.5	
Fracture:	conchoidal	Cleavage:	complete	
Crystal:	monoclinic (typically elongated columns)			
Environment:	metamorphics, pegmatites, in felsic igneous rocks containing calcium			
Association:	actinolite, idocrase, augite, hornblende, apatite, quartz			
Locals:	Austria Bulgaria France USSR Norway Texas, Michigan, California/USA			
Misc:	The name from the Greek words "epi" and "didonai", "to give"-"over", apparently in reference to one side being larger than the others in many crystals.			






Name:	eudialyte		
Class:	Silicates		
Chemistry:	$\text{Na}_4(\text{Ca,Ce})_2(\text{Fe,Mn,Y})\text{ZrSi}_8\text{O}_{22}(\text{OH,Cl})_2$ Complex Zirconium Silicate		
Color(s):	Brown, red-brown, reddish, pink		
Hardness:	5 - 5.5	SpecGrav:	2.74 - 2.98
Fracture:	uneven	Cleavage:	Indistinct
Crystal:	Trigonal, rhombohedral, often tabular or often in massive forms.		
Environment:	Forms in coarse grained igneous rocks. Chiefly in nepheline - syenites		
Association:	microcline, aegirine, nepheline		
Locals:	Montana, Arkansas, USA Canada Norway Ireland USSR		
Misc:	It is easily dissolved in acids.		






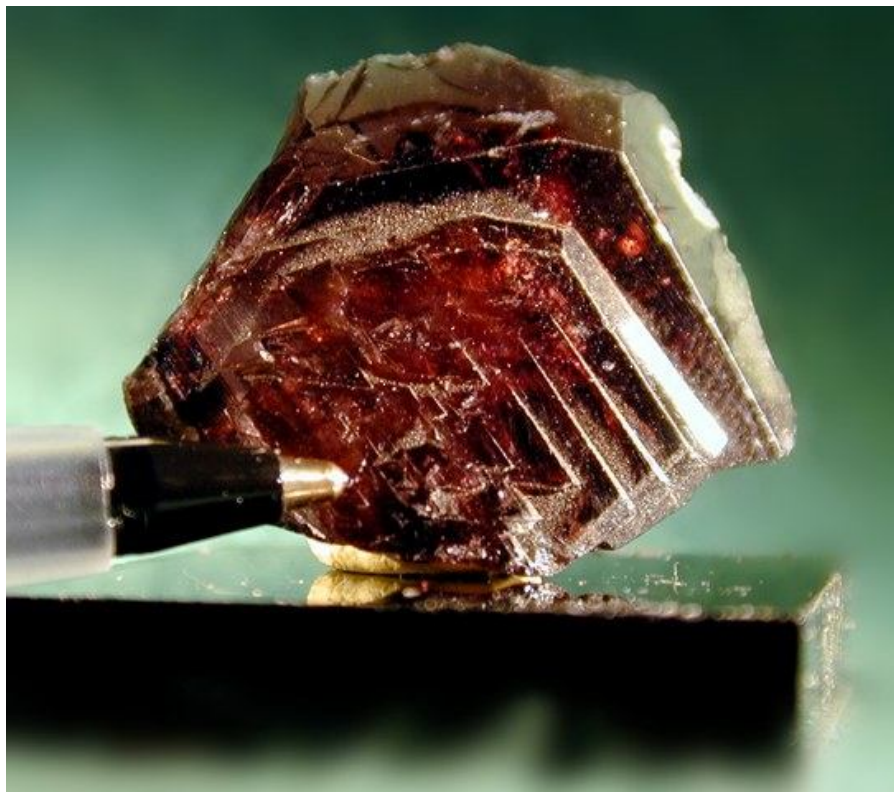
Name:	feldspar			
	Class:	Silicates		
	Chemistry:	(K,Na)AlSi ₃ O ₈ - Ca(Na)Al ₂ Si ₂ O ₈ Metal AluminoSilicates		
	Color(s):	white, bluish, gray, pink, blue, green, yellowish, brown, reddish		
	Hardness:	6 - 6.5	SpecGrav:	2.5 - 2.76
	Fracture:	uneven	Cleavage:	two directions
	Crystal:	Monoclinic (orthoclase), triclinic (microcline), triclinic (albite,anorthite)		
	Envrionment:	potassium rich feldspars (Orthoclase group) are important parts of rock forming minerals, granite, granite pegmatites, carbonatites, and hornfels. Calcium rich feldspars (plagioclase group) are also important rock forming minerals, gabbro, nepheline syenites, schists, and hornfels.		
	Association:	quartz, mica, tourmaline, topaz, garnet,augite, calcite, zeolites		
	Locals:	Colorado,Calif., Virginia, N.H., Maine, USA Brazil Germany Italy USSR Madagascar Finland Canada Tanzania Madagascar		
	Misc:	<p>The generic term "feldspar" comes from the Germanic term "feldt spat", meaning "mineral with prominent cleavage from the field". It was a prime constituent of many of the rocks over turned by farmers while plowing their fields. The feldspars are made up of three fundamental members and a wide number of chemical mixtures. There is the potassium rich member KAlSi₃O₈ (Orthoclase), the sodium rich member NaAlSi₃O₈ (albite), and the calcium member CaAl₂Si₂O₈ (anorthite). These three members make up the vertices of a solid solution phase diagram. Orthoclase takes its name from the Greek "orthos", meaning "upright" and "klasis" meaning "fracture". This is due to its perfect right angle cleavage. The "albite" member gets its name from the Latin "albus" which means "white" illuding to its color. The calcium end member (anorthite) gets its name from the Greek, "an-" (meaning a negative), and "orthos" meaning "upright", ie. "not-upright" cleavage. The sodium-rich (albite) and the calcium-rich (anorthite) form a continuous series of what is known as the "plagioclase" feldspars. The ratios are as follows: Albite (100) - Anorthite(0) Albite Albite (90) - Anorthite(10) oligoclase Albite (70) - Anorthite(30) andesine< Albite (30) - Anorthite(70) labradorite Albite (10) - Anorthite(90) bytownite Albite (0) - Anorthite(100) Anorthite</p> <p>"oligoclase" comes from the Greek "oligos", meaning "little" and "klasis" meaning "fracture". "Andesine" is named for the after a locality in the Andes, "Labradorite" is named for Labrador, and "Bytownite" is named for the locality Bytown in Ottawa, Canada. "Orthoclase" composition has a variety of different crystal structures based on their temperature of formation. Adularia, sanadine, and microcline. The potassium-sodium series are known as the "potash feldspars". The name "Andularia" comes</p>		

from a locality in Switzerland known as the Adula Mts., "Sanadine" comes from the Greek "sanis" and "inos", which mean "tablet" and "like". "like a tablet" from its tabular habit. "Microcline" comes from the Greek "mikos" and "klinein" meaning "small" and "to incline". The green variety of microcline is called "amazonite" and is often cut as a cabochon. The Adularia variety is called "moonstone" in the gem trade, and has what is described as "adularescence" (a blue-white schiller effect.) There is also a variety of plagioclase that shows this same effect and is known as "moonstone" too. Labradorite may show what is called "labradorescence", a bluish to yellow schiller effect. Labradorite is sometimes found in pale-yellow, transparent crystals as is orthoclase, and both are cut into faceted gemstones. When tiny hematite or goethite platelets are trapped in feldspar it is known as Aventurine feldspar or "sunstone".






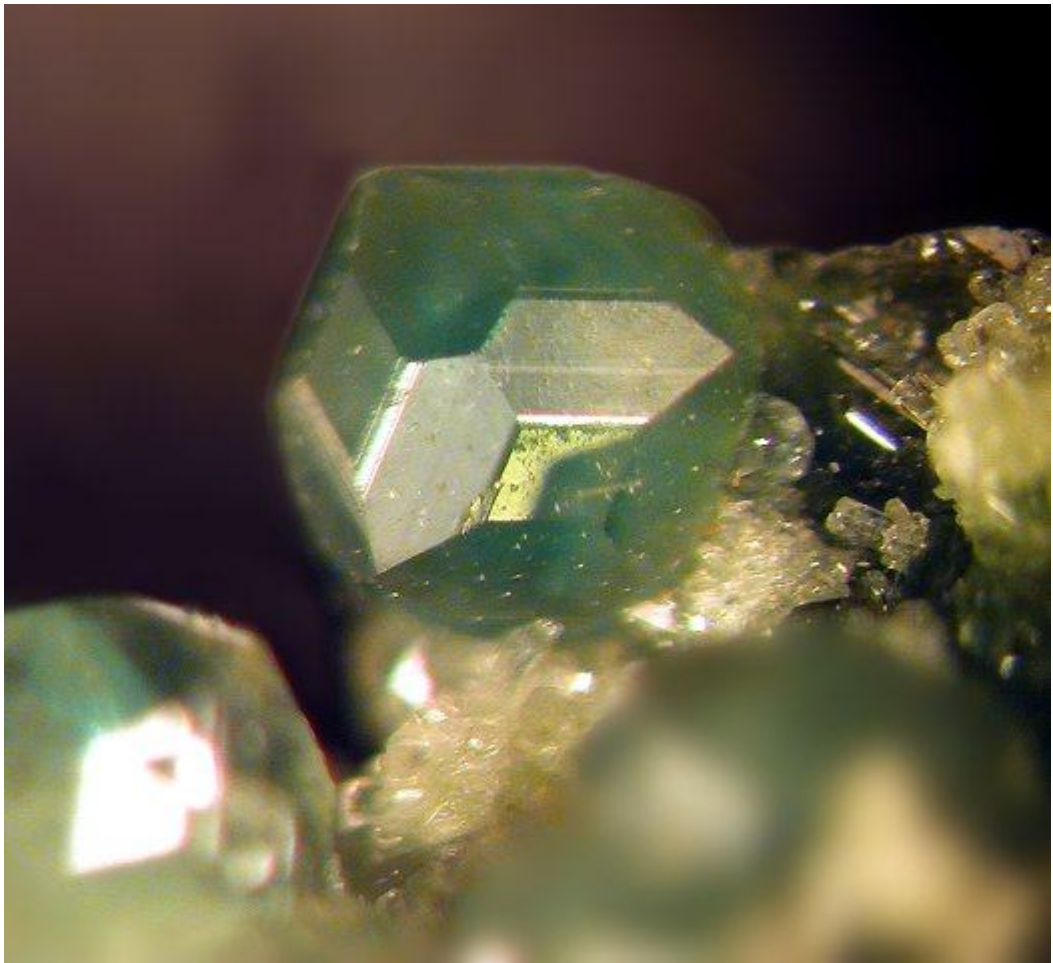
Name:	ferroAuxinite			
Class:	Silicates			
Chemistry:	Ca2 Fe Al2 BO3 Si4O12 (OH) Boro-Calcium Iron AluminoSilicate			
Color(s):	Yellow, yellow-brown			
Hardness:	6.5 - 7.0	SpecGrav:	3.28	
Fracture:	Brittle	Cleavage:	2 good, 2 poor	
Crystal:	Triclinic - often platy			
Envronment:				
Association:				
Locals:	Russia			
Misc:	Name from Iron and Axinite. A series mineral with an Iron rich end-member and a Manganese rich end member. The name ³ axinite ² comes from the Greek ³ axine ² meaning axe, probably due to its rather distinctive crystal form.			






Name:	grossular Garnet (var Hessonite)			
	Class:	Silicates		
	Chemistry:	Ca3Al2(SiO4)3 Calcium aluminum silicate (Hessonite contains some iron)		
	Color(s):	honey, brown, brown-orange Streak: white		
	Hardness:	6.5 - 7.5	SpecGrav:	3.59 - 3.68
	Fracture:	conchoidal	Cleavage:	none
	Crystal:	isometric (icositetrahedron, dodecahedral etc.) often aggregates		
	Environment:	contact metamorphics,		
	Association:	diopside, wollastonite, idocrase		
	Locals:	Kenya South Africa Italy USSR Canada Mexico Maine/USA		
Misc:	The name Grossular comes from the Latin Grossulara (the name of gooseberry fruit) which is the same color as the greenish variety of garnet. The name Hessonite comes from the Greek word meaning "less". Soluble in hot sulfuric acid.			






Name:	hemimorphite			
Class:	Silicates			
Chemistry:	$\text{Zn}_4 \text{Si}_2\text{O}_7 (\text{OH})_2 \cdot \text{H}_2\text{O}$			
Color(s):	Clear, white, brown, yellow brown streak: white			
Hardness:	5	SpecGrav:	3.4 - 3.5	
Fracture:	conchoidal	Cleavage:	perfect	
Crystal:	Orthorhombic - Pyramidal - often bladed or botryoidal			
Environment:	develops at low temperatue in hydrothermal replacement deposits			
Association:	, calcite, limonite, aurichalcite, smithsonite			
Locals:	Mexico England NM, NJ, USA Zambia			
Misc:	Named after the hemimorphic nature of the crystals, it has different terminations at each end. The ³ hemi ² means ³ half ² and the ³ morph ² means ³ shape ² . It is also pyroelectric and piezoelectric.			






Name:	heulandite			
	Class:	Silicates		
	Chemistry:	(Na,K,Ca,Sr,Ba)5Al9Si27* 26 H2O zeolite - hydrous sodium calcium aluminum silicate		
	Color(s):	red, orange, white, gray, Streak: white		
	Hardness:	3.5 - 4.0	SpecGrav:	2.1 - 2.2
	Fracture:	uneven	Cleavage:	perfect 1 direction
	Crystal:	monoclinic (often tabular "coffin" shaped crystals)		
	Environment:	in cavities in basaltic rocks, and sometime contact metamorphics.		
	Association:	other zeolites, quartz, calcite		
	Locals:	Nova Scotia/Canada Brazil Iceland New Jersey/USA Norway		
	Misc:	it is one of the most open structured of the zeolite and capable of holding/trapping a number of large ions.		






Name:	hornblende			
	Class:	Silicates		
	Chemistry:	(Ca,Na,K)2-3(Mg,Fe,Al)5(SiAl)8O22(OH)2 Complex hydro-Silicate		
	Color(s):	green, brown, black		
	Hardness:	5 - 6	SpecGrav:	3 - 3.4
	Fracture:	uneven	Cleavage:	perfect
	Crystal:	Monoclinic (usually long prismatic, sometimes w/ diamond shaped cross-section)		
	Environment:	a major rock-forming mineral, found in igneous and metamorphic rocks.		
	Association:	augite,garnet,biotite,feldspars,quartz,epidote		
	Locals:	New Jersey, Idaho, USA Canada USSR Japan		
	Misc:	The name comes from a old German miners word, "horn", which may be related to the color of horn, and the German word "blenden", which means "to deceive". It looked like many of the other mineral ores which could be smelted to produce metals, but hornblende failed to be smelted.		





Name:	ilvaite			
	Class:	Silicates		
	Chemistry:	$\text{CaFe}_{2+3}(\text{SiO}_4)_2(\text{OH})$		
	Color(s):	dark brown, brownish-blackish, black streak; brownish - back		
	Hardness:	5.5 - 6.0	SpecGrav:	3.95-4.05
	Fracture:	uneven	Cleavage:	distinct two directions
	Crystal:	Orthorhombic - Dipyramidal		
	Environment:	occurs with other ore bodies especially cpper and zinc deposits		
	Association:			
	Locals:	Russia Bulgaria England Germany Al., Co., Id., R.I., USA		
Misc:	Ilvaite is derive from the Latin name for the island of Elba.			





Name:	Inesite		
Class:	Silicates		
Chemistry:	Ca ₂ Mn ₇ Si ₁₀ O ₂₈ (OH) ₂ * 5H ₂ O Hydros Calcium Manganese Silicate		
Color(s):	rose, flesh-pink, pale pink, yellow, brown streak: pale-pink		
Hardness:	6.0	SpecGrav:	3.0
Fracture:	uneven	Cleavage:	perfect
Crystal:	triclinic (prismatic, fibrous, sometimes spherulitic with radiating crystals)		
Environment:	hydrothermal metamorphic rocks.		
Association:	rhodonite, axinite		
Locals:	Calif., Mexico Sweden Japan Australia		
Misc:	The origin of the name is not absolutely know, but it may be from the Greek, "ines" meaning "fibers"		





Name:	joaquinite				
	Class:	Silicates			
	Chemistry:	Ba2NaCe2Fe(Ti,Nb)2 Si8O26(OH,F)2 Hydros Ferrous Aluminum Silicate			
	Color(s):	yellow-brown, honey-yellow			
	Hardness:	5.5	SpecGrav:	3.8	
	Fracture:	conchoidal	Cleavage:	brittle	
	Crystal:	monoclinic (tabular crystals)			
	Envronment:	Two Locals San Benito Co. Calif. and Mont. St. Hilaire, Quebec, Canada			
	Association:	benitoite, neptunite			
	Locals:	Calif., USA Canada			
Misc:	Can be cleaned with dilute acid.				






<div>Name:</div>	<div>kinoite</div>				
	<div>Class:</div>	Silicates			
	<div>Chemistry:</div>	Ca2Cu2Si3O8 (OH)4			
	<div>Color(s):</div>	blue			
	<div>Hardness:</div>	5	<div>SpecGrav:</div>	3.16	
	<div>Fracture:</div>		<div>Cleavage:</div>	perfect 2 way	
	<div>Crystal:</div>	Monoclinic; usually prismatic			
	<div>Envronment:</div>				
	<div>Association:</div>				
	<div>Locals:</div>	AZ., USA /			
<div>Misc:</div>	named for a Jesuit explorer ...Eusebio Francisco Kino (1645-1711)				




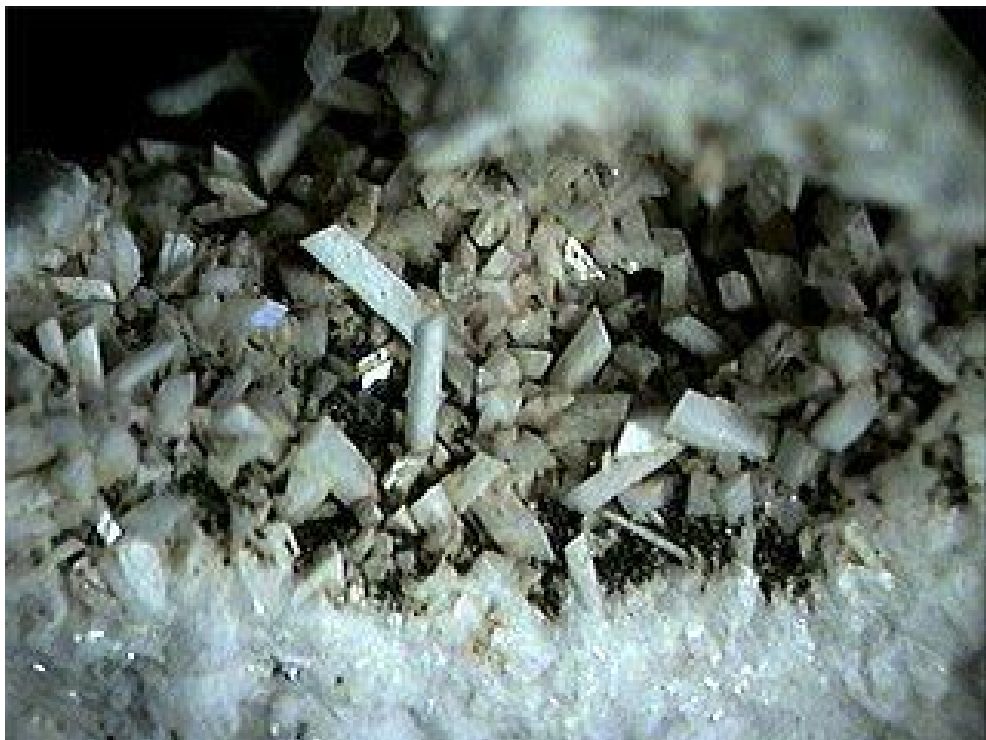


Name:	kyanite			
Class:	Silicates			
Chemistry:	Al2SiO5 Aluminum Silicate			
Color(s):	light blue, gray to greenish			
Hardness:	5.5-7.0	SpecGrav:	3.41-3.67	
Fracture:	uneven	Cleavage:	perfect	
Crystal:	Triclinic, tabular crystals, often not terminated, sometimes bent or twisted, often long and flattened			
Envrionment:	high pressure metamorphic rocks low in Ca and rich in Al.			
Association:	garnet, staurolite and micas			
Locals:	Mass, Conn., N.C., USA Brazil Switzerland Austria Italy India			
Misc:	The name comes from the Greek "kyanos", meaning "blue". The crystals are usually bladed and have a mica-like structure in one direction. It is sometimes used for the manufacture of high-temperature porcelain products. It is trimorphous with both andalustie and sillimanite.			






Name:	laumontite		
Class:	Silicates		
Chemistry:	$\text{Ca}(\text{AlSi}_2\text{O}_6)_2 \cdot 4 \text{H}_2\text{O}$ Hydrrous Calcium Aluminum Silicate		
Color(s):	white, yellow, reddish, colorless		
Hardness:	3 - 3.5	SpecGrav:	2.25 - 2.4
Fracture:	uneven	Cleavage:	complete
Crystal:	monoclinic (columnar, vertically striped)		
Environment:	occasionally found in veins of ore, often in metamorphic rocks or magmatites in pore space or crevices.		
Association:	calcite, heulandite, stilbite, analcite, albite, chlorite, quartz		
Locals:	Germany Italy New Jersey, Calif., Georgia/USA		
Misc:	Soluble in hydrochloric acid, the mineral is named for Francois Nicholas Pierre Gillet De Laumont, who discovered the first specimens in the cliffs of Brittany. Laumontite will dehydrate when exposed to the air, so crystals are often coated with a sealant to protect them.		





Name:	mesolite			
	Class:	Silicates		
	Chemistry:	Na2Ca2(Al6Si9)O30 * 8H2O Hydrous Sodium Calcium AluminoSilicate		
	Color(s):	white, colorless		
	Hardness:	5.0	SpecGrav:	2.0-2.3
	Fracture:	uneven	Cleavage:	perfect
	Crystal:	Monoclinic (usually acicular, also fibrous)		
	Environment:	a low temperature mineral associated with zeolites in basalt in volcanic rocks		
	Association:	other zeolites, apophyllite		
	Locals:	Germany Iceland India Oregon, Calif./USA Canada Australia		
Misc:	The name comes from the Greek "mesos" meaning "middle" and "lithos" meaning "stone", because its composition falls between two other minerals, natrolite, and scolecite.			





Name:	mica : Muscovite, Biotite, Phlogopite, Lepidolite		
	Class:	Silicates	
	Chemistry:	K ₂ Al ₂ ((AlSi ₃ O ₁₀))(OH,F) ₂) Muscovite (fuchsite) K(Mg,Fe) ₃ ((AlSi ₃ O ₁₀))(OH,F) ₂ Biotite K ₂ Mg ₃ ((AlSi ₃ O ₁₀))(OH,F) ₂) Phlogopite KLi ₂ Al((AlSi ₃ O ₁₀))(OH,F) ₂) Lepidolite Mixed hydrated potassium aluminum silicates with a sheet structure.	
	Color(s):	Muscovite: colorless, yellow, silvery, green (fuchsite), Biotite: black, brown, bronze, Phlogopite: reddish-brown, brown, black, yellowish, Lepidolite: purple, magenta, pink, gray	
	Hardness:	2 -3.5	SpecGrav: 2.7 - 3.8
	Fracture:	foliated	Cleavage: perfect
	Crystal:	monoclinic (tabular habit, with thin parallel growths, can easily be separated into thin layers.)	
	Environment:	common rock forming minerals (all except lepidolite), and can be found in metamorphic rocks, pegmatites, and veins.	
	Association:	quartz, calcite, spinel, garnet, feldspars, andalusite, albite	
	Locals:	USSR India Italy South Africa Canada Scotland Germany Austria Finland Switzerland Colorado, Utah, S.D., N.H., Calif., Idaho, Maine, USA	
	Misc:	Muscovite: comes from the local Muscovy (Russia) where in ancient times it was used as glass in buildings. Biotite: is named after J.B. Biot, a French astronomer, physicist and mathematician. Phlogopite: comes from the Greek "phlogopos", meaning "fiery-look" from its reddish-brown color. Lepidolite: comes from the Greek "lepidos", meaning "scale", alluding to the scaly conglomerates in which it often forms . Phlogopite and Biotite both dissolve in sulfuric acid. Lepidolite give a RED flame test. Fuchsite: is a variety of muscovite that contains traces of chromium and is colored green. There have been some large finds in Minas Gerais, Brazil, but much of it is miss-labeled as "Fuschite".	



Muscovite




Biotite

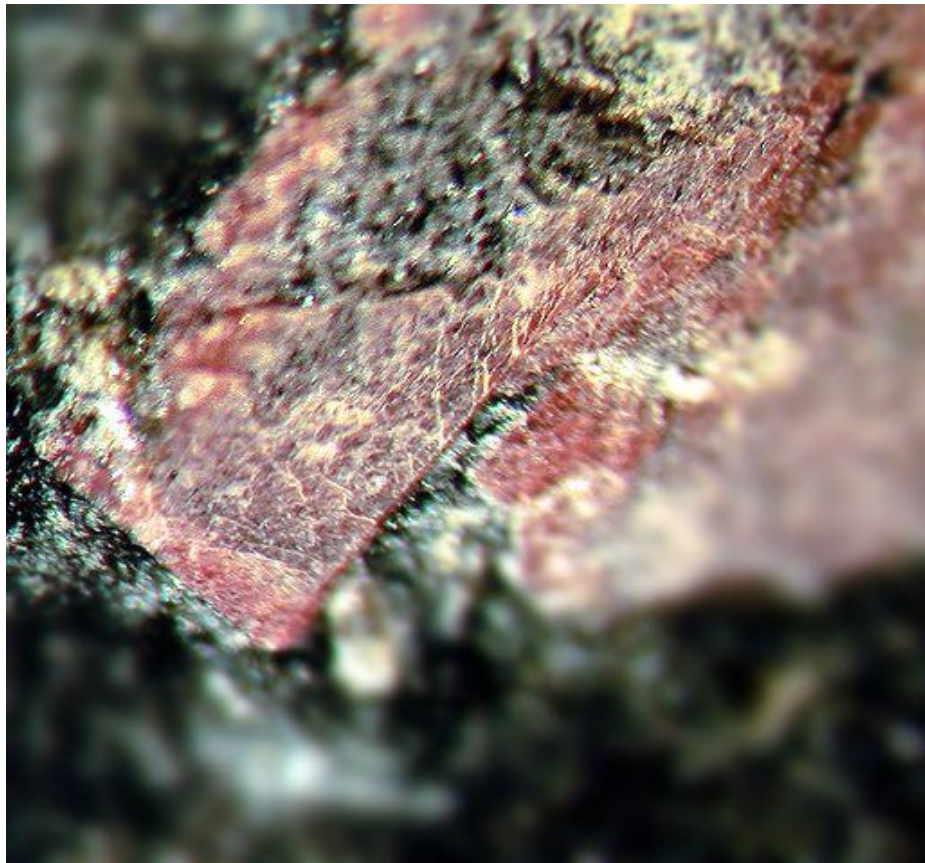


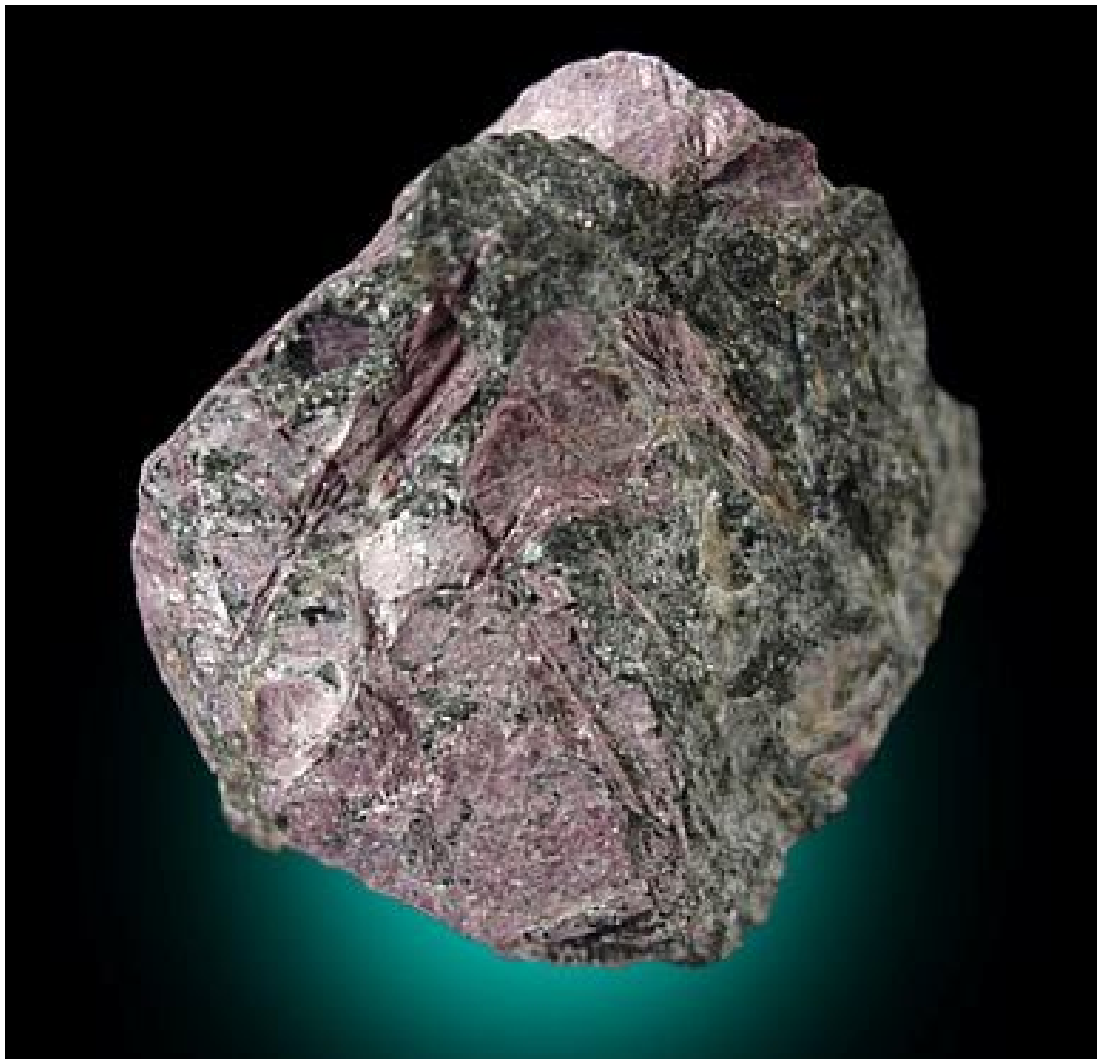
Phlogopite




Lepidolite

Name:	murmanite			
	Class:	Silicates		
	Chemistry:	Na2(Ti, Nb)2Si2O9 *nH2O Sodium Titano/Niobium Silicate		
	Color(s):	Lilac, pink, bright-pink		
	Hardness:	2 - 3	SpecGrav:	2.76 - 2.84
	Fracture:	uneven	Cleavage:	perfect
	Crystal:	Triclinic? Euhedral crystals rare, aggregates of platy crystals, or small lamellar masses		
	Envronment:	alkali pegmatites, nepheline-syenite		
	Association:	aegirine, microcline, eudialyte, sodalite		
	Locals:	Russia Canada		
Misc:	Very rare mineral, looks a little like lepidolite			






Name:	natrolite				
	Class:	Silicates			
	Chemistry:	Na2Al2Si3O10 * 2H2O Hydrated sodium aluminum silicate (zeolite)			
	Color(s):	white, yellowish,brown, reddish, colorless			
	Hardness:	5 - 5.5	SpecGrav:	2.2 - 2.3	
	Fracture:	conchoidal	Cleavage:	complete	
	Crystal:	orthorhombic (prismatic, acicular, filamentary)			
	Envronment:	lining cavities in basalts and other lavas, sometimes as an alteration product in syenites. Hydrothermal veins.			
	Association:	benitoite,neptunite,calcite,apophyllite			
	Locals:	Canada India Italy Greenland France Ireland New Jersey, Oregon, Calif./USA			
Misc:	Soluble in strong acids leaving silica gel, loses water at about 300 C. Sometimes fluoresces orange. The name comes from the Greek "natron", meaning that it contains sodium.				





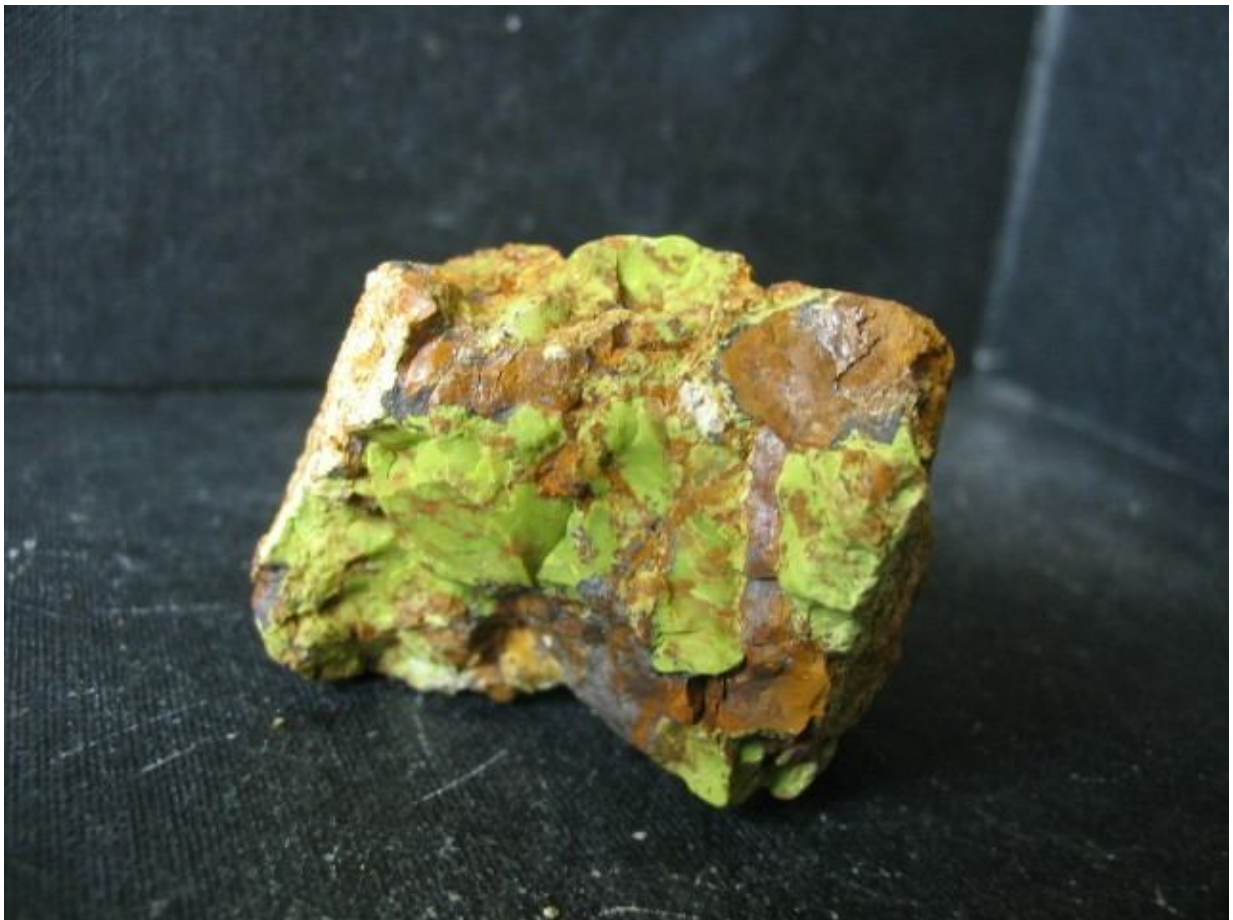
Name:	neptunite			
	Class:	Silicates		
	Chemistry:	(Na,K)3 Li (Fe,Mn)2 Ti2O2 (Si4O11)2 Complex Titanium Silicate		
	Color(s):	black, red-brown internal reflection		
	Hardness:	5 - 6	SpecGrav:	3.19 - 3.23
	Fracture:	conchoidal	Cleavage:	perfect
	Crystal:	monoclinic (sell formed long prisms are common)		
	Envronment:	hydrothermal replacement deposits, also in nepheline syenite pegmatites.		
	Association:	benitoite, aegirine, natrolite		
	Locals:	USA California, USA Canada Ireland Greenland		
	Misc:	Named after the roman god of the sea, Neptune, because it is often found with Aegirine, and Aegirine is the Norse name for the God of the Sea.		






Name:	nontronite			
	Class:	Silicates		
	Chemistry:	NaFe2(Si,Al)4O10(OH)2 € H2O		
	Color(s):	pale green, olive green, opaque streak:white		
	Hardness:	1.5	SpecGrav:	2.30
	Fracture:	earthy-dull	Cleavage:	perfect
	Crystal:	monoclinic fine grained clay like		
	Environment:			
	Association:			
	Locals:	Ausralia Brazil England Az., Ca., Me., W.V., USA		
Misc:	local name based on Nontrone, France			






Name:	okenite				
	Class:	Silicates			
	Chemistry:	CaH2Si2O6* H2O zeolite			
	Color(s):	white, yellow, bluish Streak: white			
	Hardness:	4.5 - 5	SpecGrav:	2.3	
	Fracture:	uneven	Cleavage:	complete	
	Crystal:	triclinic (flat acicular common)			
	Envrnoment:	cavities in basaltic rocks			
	Association:	stilbite, heulandite			
	Locals:	Poona/India Iceland Greenland Chile USA			
Misc:	crystals a very fragile and often form in small, radiating, spherical clusters.				






Name:	olivine (forsterite - fayalite)		
Class:	Silicates		
Chemistry:	(Mg,Fe) ₂ SiO ₄ Mg ₂ SiO ₄ - forsterite Fe ₂ SiO ₄ - fayalite		
Color(s):	brown-green, brown, dark green, apple green		
Hardness:	6.5 - 7.0	SpecGrav:	3.27 - 3.37
Fracture:	brittle	Cleavage:	good
Crystal:			
Environment:	occurs in several rocks as a rock forming mineral. Also in volcanic bombs.		
Association:			
Locals:	Canada Russia Az., Ca., USA Italy Pakistan		
Misc:	Olivine is named for its green color, and ³ fayalite ² after Fayal, and island in the Azores. Forsterite is named after Johann R. Forster, a German naturalist. When found in large enough sizes Olivine is known as Peridot and used as gem in the jewelry trade.		






Name:	opal			
	Class:	Silicates		
	Chemistry:	SiO2 * nH2O Hydrated Silica		
	Color(s):	colorless, red, green, blue, brown, black, milky, yellow etc. "precious opal" is distinguished by "color-play" or "fire"		
	Hardness:	5.5 - 6.5	SpecGrav:	1.0 - 2.5
	Fracture:	conchoidal	Cleavage:	none
	Crystal:	amorphous (a layered silica formed in a precipitation process and cemented with a hydrous silica cement)		
	Environment:	precipitation process, or "fossilization product" as in the replacement of organic materials (opalized wood, clam, shell, etc.)		
	Association:	zeolites, limonite, chalcedony		
Locals:	Austrailia Brazil Nevada, Wyoming, Montana, USA Tanzania Iceland Mexico			
Misc:	Opal may go by a number of names depending on the kind, some examples include hyalite (clear transparent samples 1-3 below), Cloudy or Milky (samples 4-6), clear or slightly cloudy (samples 7-9), fossilized opal (samples 10-11), sand stone opal (samples 12-14), Mexican opal (15), fire opal (16), green prose opal, brown liver opal ... It is easily damaged by dehydration thermally or chemically. Heat can dehydrate and crack opal, and solvents with an affinity for water can damage opal (acetone, strong bases, some acids). Soluble in KOH solutions.			






Name:	piemontite (piedmontite)		
	Class:	Silicates	
	Chemistry:	$\text{Ca}_2(\text{Mn,Fe})\text{Al}_2(\text{SiO}_4)(\text{Si}_2\text{O}_7)\text{O}(\text{OH})$	
	Color(s):	red, brown-rd, reddish-black, black	
	Hardness:	6-6.5	SpecGrav: 3.4-3.5
	Fracture:		Cleavage: good
	Crystal:	monoclinic; prismatic, acicular	
	Environment:	found in manganese deposits, and shists	
	Association:	quartz, glaucophane, braunite, rhodonite, rhodochrosite	
	Locals:	Italy / NM., USA / France / Egypt / Scotland / Sweden /	
	Misc:	named from locality of Piedmont, Italy	






Name:	prehnite				
	Class:	Silicates			
	Chemistry:	Ca2Al2Si3O10(OH)2 hydrous calcium aluminum silicate			
	Color(s):	white, light green, gray, colorless, Streak: white			
	Hardness:	6 - 6.5	SpecGrav:	2.9 - 2.95	
	Fracture:	uneven	Cleavage:	perfect 1 direction	
	Crystal:	orthorhombic (often forms in lamellar aggregates) rarely good crystals			
	Environment:	forms in cavities in basaltic rocks, low temperature hydrothermal fissures, and in limestone			
	Association:	datolite, calcite, pectolite, quartz, zeolites			
	Locals:	New Zealand India Switzerland Scotland California, Colorado, Michigan/USA			
	Misc:	Named for the Dutch mineralogist Hendrik von Prehn. It is sometimes faceted when crystals are found.			






Name:	quartz			
	Class:	Silicates		
	Chemistry:	SiO2 Silicon dioxide		
	Color(s):	clear, white, brown, yellow, purple, green, blue, Streak: white		
	Hardness:	7	SpecGrav:	2.5 - 2.7
	Fracture:	conchoidal	Cleavage:	none
	Crystal:	hexagonal (prisms, pyramidal)		
	Envronment:	develops in a wide variety of environments, igneous, metamorphic, hydrothermal ...		
	Association:	pyrite, calcite, feldspars, garnet, sphalerite ...		
	Locals:	Switzerland Brazil Arkansas, Colorado, New York/USA Austrailia Mexico		
Misc:	The Greeks called quartz "krystallos" or "ice", but the name remained with the origin of the word crystal and not with quartz. The name appears to be from the German "Quartz", of uncertain origin.			

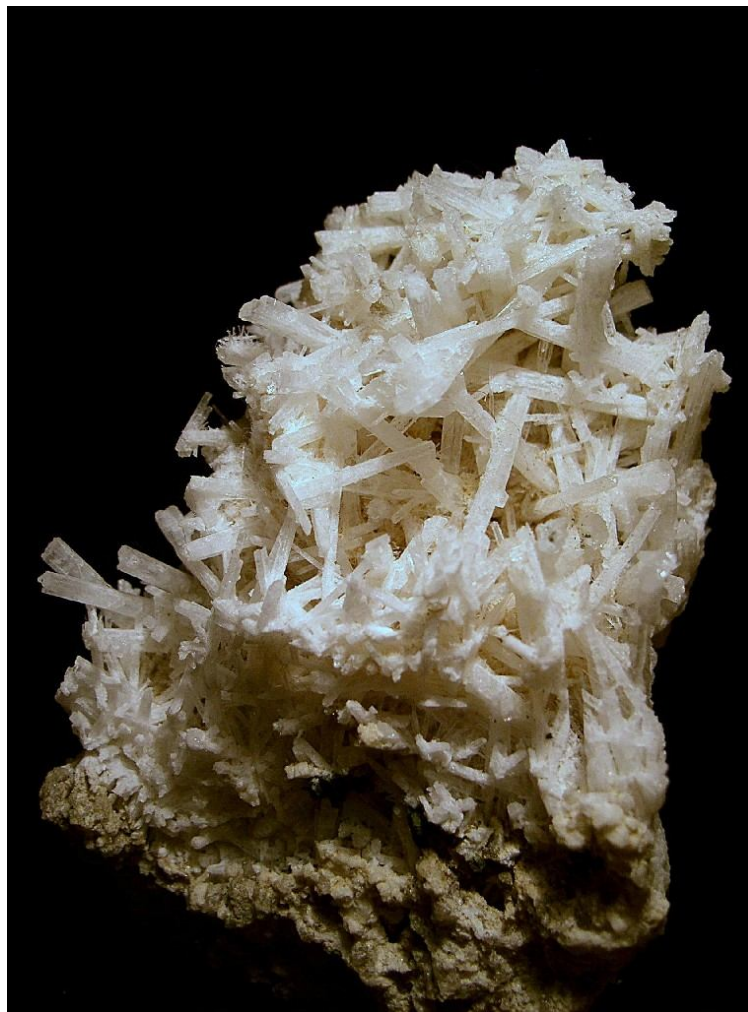






Name:	scolecite			
Class:	Silicates			
Chemistry:	Ca[Al2Si7O10] * 3 H2O zeolite member			
Color(s):	white, colorless, Streak: white			
Hardness:	5 - 5.5	SpecGrav:	2.27 - 2.4	
Fracture:	conchoidal	Cleavage:	perfect	
Crystal:	monoclinic (often fine fibers)			
Envrnoment:	cavities in volcanic rock, and contact metamorphics			
Association:	stilbite, heulandite, apophyllite			
Locals:	Poona/India Iceland USSR California, Colorado/ USA Brazil			
Misc:	soluble in dilute HCl. from the Greek "skolex", or "worm", from the worm-like shape it creates when heated.			






Skolecite - Jílové u Děčína; Czech republic

Name:	sillimanite (fibrolite)				
	Class:	Silicates			
	Chemistry:	Al2SiO5 Aluminum Silicate			
	Color(s):	gray-white, brown, greenish-brown			
	Hardness:	6 - 7	SpecGrav:		3.2 - 3.3
	Fracture:	uneven	Cleavage:		perfect one direction
	Crystal:	orthorhombic -usually fibrous, columnar			
	Environment:	a metamorphic mineral found in shists,			
	Association:	biotite, quartz, almandine			
	Locals:	MA, CN, SC, USA Germany Austira Italy Brazil S. Africa			
	Misc:	Named after Benjamin Sillman, first professor of Mineralogy at Yale.			






Name:	spessartite Garnet			
	Class:	Silicates		
	Chemistry:	Mn3Al2(SiO4)3 Manganese aluminum silicate (var. garnet)		
	Color(s):	orange to reddish-brown, pink Streak: white		
	Hardness:	7.0 - 7.5	SpecGrav:	4.12 - 4.2
	Fracture:	conchoidal	Cleavage:	none
	Crystal:	isometric (icositetrahedron, dodecahedral etc.) often aggregates		
	Envronment:	granite pegmatites, and shists		
	Association:	albite, muscovite, microcline, quartz		
	Locals:	Virginia, California/USA Brazil Germany Sweden		
	Misc:	Named after an occurrence in the Spessart district, Bavaria, Germany.		






Name:	staurolite			
	Class:	Silicates		
	Chemistry:	Fe2Al9Si4O22(OH)2 Hydros Ferrous Aluminum Silicate		
	Color(s):	yellow-brown, reddish to brownish, black		
	Hardness:	7 - 7.5	SpecGrav:	3.7 - 3.8
	Fracture:	conchoidal	Cleavage:	incomplete
	Crystal:	monoclinic (in single or very often twinned crystals, often in the general shape of a cross) 60 or 90 degrees		
	Environment:	metamorphic rocks.		
	Association:	garnets, kyanite, andalusite, quartz		
	Locals:	USSR France Austria Switzerland Scotland Namibia Tennessee, New Hampshire, Georgia, USA		
Misc:	The name is derived from the Greek word "stauros", meaning "cross". It comes from the common cross shaped twinning pattern.			






Name:	stilbite			
Class:		Silicates		
Chemistry:		Ca[Al2Si7O18* 7 H2O NaCa4[[Al9Si27]O72* 30 H2O a Zeolite member		
Color(s):		white, pinkish, brown, gray, yellowish, Streak: white		
Hardness:		3.5 - 4.0	SpecGrav:	2.1 - 2.2
Fracture:		uneven	Cleavage:	complete
Crystal:		monoclinic		
Environment:		cavities in volcanic rock		
Association:		zeolites, calcite, aphopholyte, heulandite, scolecite		
Locals:		Poona/India Iceland USSR California, Colorado/ USA Brazil		
Misc:		The name from the Greek word "stilbein", "to shine", it has a pearly luster.		






Name:	titanite (Sphene)			
	Class:	Silicates		
	Chemistry:	CaTiSiO5 Calcium Titanium Silicate		
	Color(s):	brown-black, yellow, gray, green		
	Hardness:	5 - 5.5	SpecGrav:	3.4 - 3.6
	Fracture:	conchoidal	Cleavage:	distinct
	Crystal:	monoclinic (usually sharp edged and tabular		
	Environment:	found in magmatic and metamorphic veins		
	Association:	chlorite, hornblende, rutile, apatite, nepheline, feldspars, quartz, calcite		
	Locals:	Germany Maine, Massachusetts, New York, Montana, USA Mexico Austria Italy Switzerland Canada USSR Mexico		
	Misc:	The Sphene name comes from the Greek "sphen", meaning "wedge", from its sharp wedge shaped crystals. The titanite comes from the titanium constituent of it composition. Soluble in sulfuric acid.		






Name:	topaz			
	Class:	Silicates		
	Chemistry:	Al2(SiO4)(F,OH)2 Aluminum hydroxy fluoro silicate		
	Color(s):	blue, orange, clear, yellow, red, pink, violet, green Streak: white		
	Hardness:	8	SpecGrav:	3.5 - 3.6
	Fracture:	conchoidal	Cleavage:	perfect basal
	Crystal:	orthorhombic (often capped columnar-pyramidal)		
	Envronment:	high temperature formation in igneous rocks and veins, also hydrothermal replacements		
	Association:	albite, quartz, beryl, rutile		
Locals:	USSR Brazil Colorado, Utah, Maine/USA Germany Burma Sri Lanka Pakistan			
Misc:	The name Topaz is thought to have come from the island named Topazion (after the Greek "topazos"), which was later changed to Zebergit, and is now called St. John's Island, in the Red Sea. It is not found there, but it is believed that it may have been the name originally given to peridot (mineral olivine) which is abundant there.			






Name:	tourmaline			
	Class:	Silicates		
	Chemistry:	$(\text{Ca}, \text{K}, \text{Na})(\text{Al}, \text{Fe}, \text{Li}, \text{Mg}, \text{Mn})_3(\text{Al}, \text{Cr}, \text{Fe}, \text{V})_6(\text{BO}_3)_3 \text{Si}_6\text{O}_{18}(\text{O}, \text{OH}, \text{F})_4$ Complex Silicate		
	Color(s):	black(schorl)(uvite), dravite(brown), pink & red (rubellite), blue (indicolite), green, chrome green, yellow, orange, violet (siberite), multicolored		
	Hardness:	7 - 7.5	SpecGrav:	3.0 - 3.3
	Fracture:	conchoidal	Cleavage:	none
	Crystal:	Hexagonal, short or long prismatic with rounded triangular cross section, striated lengthwise, black varieties sometimes fan like, good terminations on many, flat tops on some		
	Envrionment:	igneous and metamorphic rocks and veins. Pegmatites,schists, hypothermal veins, hydrothermal replacement deposits.		
	Association:	quartz, lepidolite, spodumene, mica, feldspars, topaz, apatite		
	Locals:	Calif., Maine, USA Brazil Italy Germany Pakistan USSR Madagascar Afghanistan Tanzania		
	Misc:	The name comes from the Singhalese term "turamali", which was used as a general description for mixtures of gem pebbles from the alluvial deposits of Ceylon (Sri Lanka). Often color zoned by length or from the center out. Tourmaline is pyroelectric (generates electricity with heat), and piezoelectric (generates electricity with pressure). The Dutch called tourmaline, aschentrekker (ash remover), because tourmaline could be heated and it would attract ashes from a pipe.		








Name:	uranophane (uranotile)				
	Class:	Silicates			
	Chemistry:	$\text{CaH}_2(\text{UO}_2 \text{SiO}_4)_2 \cdot 5\text{H}_2\text{O}$ Hydrated Calcium Uranium Silicate			
	Color(s):	yellow			
	Hardness:	2.5	SpecGrav:	3.8 - 3.9	
	Fracture:	conchoidal	Cleavage:	incomplete	
	Crystal:	monoclinic (prismatic and often acicular)			
	Environment:	oxidized zone of uranium deposits in pegmatites			
	Association:	torbernite, autunite, uranocircite, fluorite			
	Locals:	Germany Zaire New Mexico, USA Canada Austrailia			
Misc:	From uran and phanos - "to appear."				





Name:	uvarovite			
	Class:	Silicates		
	Chemistry:	Ca3Cr2(SiO4)3 Calcium chromium silicate (garnet)		
	Color(s):	emerald green Streak: pale green		
	Hardness:	6.5 - 7.5	SpecGrav:	3.4 - 3.7
	Fracture:	conchoidal	Cleavage:	none
	Crystal:	Isometric (dodecahedrons and trapezohedrons common)		
	Envronment:	hydrothermal metamorphics, and plutonic rocks		
	Association:	olivine, chromite		
	Locals:	USSR Austrailia Canada India Oregon/USA South Africa		
	Misc:	Named after Count S.S. Uvarov, Russian mineral collector.		





Name:	uvite (var of tourmaline)			
	Class:	Silicates		
	Chemistry:	$(\text{Ca,Na})(\text{Mg,Fe}^{++})_3\text{Al}_5\text{Mg}(\text{BO}_3)_3\text{Si}_6\text{O}_{18}(\text{OH,F})_4$		
	Color(s):	greenish streak: light brown		
	Hardness:	7.5	SpecGrav:	3.1 - 3.25
	Fracture:	sub conchoidal	Cleavage:	indistinct
	Crystal:	Trigonal - Ditrigonal Pyramidal		
	Envrionment:	pegmatites, hydrothermal veins, schists		
	Association:	quartz, feldspar, mica, beryl		
	Locals:	Brazil Canada Greenland Nepal Sri Lanka N.J., N.Y., USA		
	Misc:	Named after its locality, province Uva, Sri Lanka.		





Name:	vesuvianite (idocrase)			
	Class:	Silicates		
	Chemistry:	Ca10 (Mg,Fe)2 Al4 [(OH)4 (SiO4)5 (Si2O7)2] Hydrated Calcium Magnesium Aluminum Silicate		
	Color(s):	brown, green, magenta, rarely yellow, blue, black, gray		
	Hardness:	6.5	SpecGrav:	3.27 - 3.45
	Fracture:	uneven	Cleavage:	incomplete
	Crystal:	tetragonal (short and long columnar, dipyramidal, sometimes acicular) often vertically striated		
	Envronment:	metamorphic and igneous rocks as a by product of volcanic activity.		
	Association:	garnet, diopside, wollastonite, epidote		
	Locals:	Germany Switzerland California, USA Canada Mexico Italy USSR		
Misc:	The name Vesuvianite comes from the famous locality in Italy, Mt. Vesuvius. The name Idocrase comes from the Greek word "eidos", meaning "form" and "krausis" meaning "mixture". This referenced its mixed crystal form. Partially soluble in acids.			





Name:	willemite			
	Class:	Silicates		
	Chemistry:	Zn2SiO4 Zinc Silicate		
	Color(s):	colorless, brown, yellow-green, reddish, black, Streak: white		
	Hardness:	5.5	SpecGrav:	3.9 - 4.2
	Fracture:	uneven to conchoidal	Cleavage:	good 3 directions
	Crystal:	Hexagonal (short prismatic or rhombohedral)		
	Environment:	hydrothermal replacement deposits		
	Association:	calcite, zincite, franklinite, rhodonite, hemimorphite		
	Locals:	Zambia Greenland New Jersey,New Mexico/USA Mexico		
	Misc:	Named for the Willem I, king of Netherlands. It fluoresces a bright yellow-green		






Name:	zoisite			
Class:	Silicates			
Chemistry:	$\text{Ca}_2\text{Al}_3[\text{Si}_3\text{O}_{12}(\text{OH})]$			
Color(s):	gray, yellowish brown, greenish, pink (thulite), blue (tanzanite)			
Hardness:	6-6.5	SpecGrav:	3.2-3.4	
Fracture:	conchoidal	Cleavage:	one good	
Crystal:	Orthorhombic; long prismatic, deeply striated, columnar, bladed, fibrous			
Envronment:	only in metamorphic rocks			
Association:	hornblende, almandine, glaucophane, wollastonite			
Locals:	NC. CA., TN., CO., USA / Tanzania / Italy / USSR /Austria / Switzerland			
Misc:	named for Baron S. Zois van Edeltein (1747-1819), thulite named for Thule and ancient name for Norway, Tanzanite for the local Tanzania			

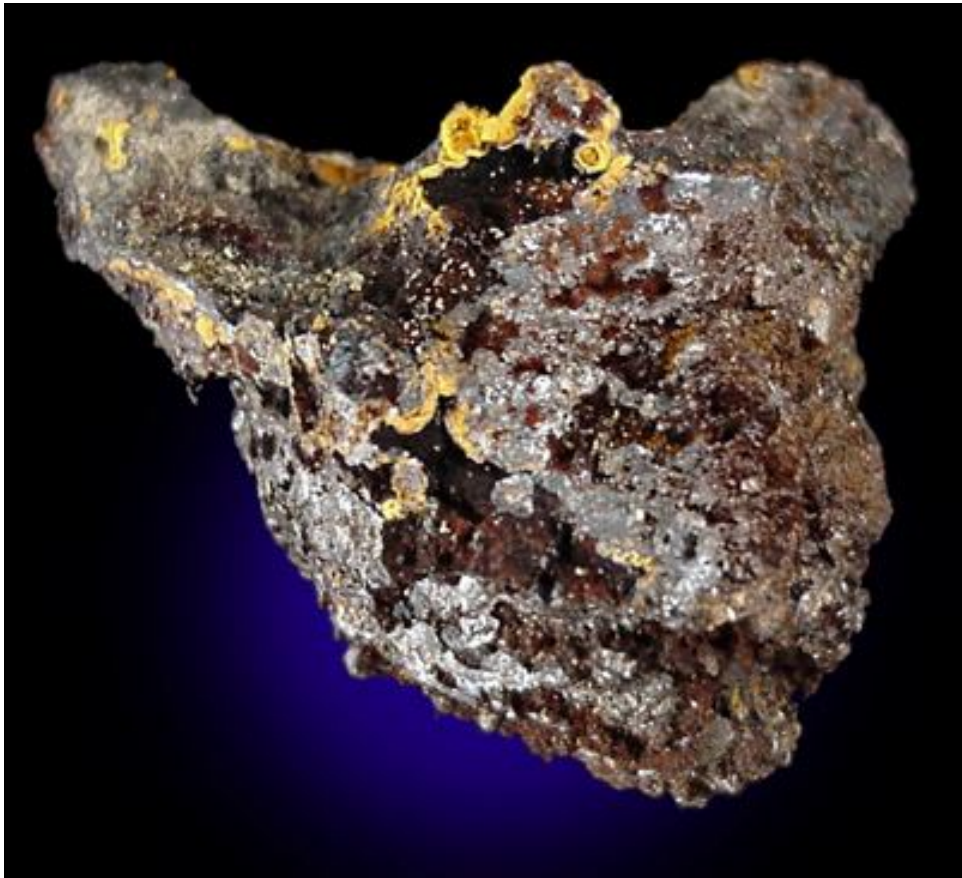





Halides

Name:	chlorargyrite			
	Class:	Halides		
	Chemistry:	AgCl Silver Chloride		
	Color(s):	colorless, pearly gray to brown, decomposes to violet or black upon exposure to sunlight streak: white		
	Hardness:	2.5	SpecGrav:	5.5 - 5.6
	Fracture:	uneven	Cleavage:	perfect
	Crystal:	isometric (crystals are somewhat rare as it decomposes easily to a powdery crust. Cubes are a common crystal habit when present)		
	Environment:	alteration zone in epithermal veins, and hydrothermal replacement deposits		
	Association:	acanthite, barite, fluorite, calcite		
	Locals:	Nevada, Calif., Idaho, USA Chile Germany Bolivia Peru England France Australia		
Misc:	The name is derived from the Greek word "argyros", meaning "silver", not from the element, but from the silvery sheen of the minerals luster. "Chlor" does come from the elemental halide name, chlorine.			





Name:	fluorite		
Class:	Halides		
Chemistry:	CaF ₂ Calcium Fluoride		
Color(s):	violet, blue, green, orange, yellow, pink, etc., Streak: white		
Hardness:	4	SpecGrav:	3.0 - 3.2
Fracture:	conchoidal	Cleavage:	perfect
Crystal:	contact metamorphics, epithermal deposits, hydrothermal replacements		
Environment:	contact metamorphics, epithermal deposits, hydrothermal replacements		
Association:	barite, apatite, calcite, galena, sphalerite, siderite		
Locals:	England Illinois, Kentucky, Ohio, Colorado/USA Mexico Canada		
Misc:	Often violet, green, or blue fluorescence, dangerous to add acid - forms toxic HF, from the Latin "fluere", "to flow" (because it was used in ancient times as a flux)		

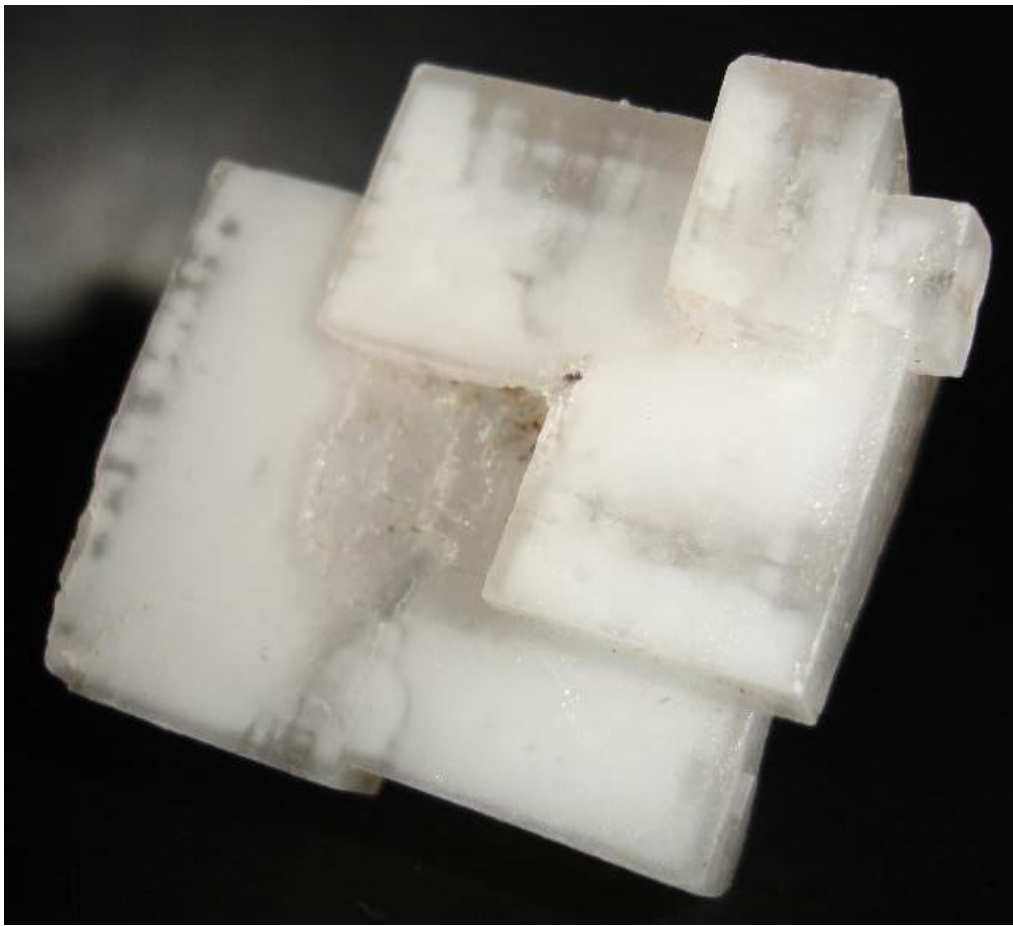







Name:	halite			
	Class:	Halides		
	Chemistry:	NaCl		
	Color(s):	white, reddish-orange, blue, yellow, red		
	Hardness:	2	SpecGrav:	2.1-2.2
	Fracture:	conchoidal	Cleavage:	perfect 3 directions
	Crystal:	Isometric; usually cubes, rarely octahedrons.		
	Environment:	evaporative deposits in sedimentary deposits.		
	Association:	gypsum, thenardite, borax		
	Locals:	CA, KA, LA, MI,		
	Misc:	the name halite comes from the Greek, hals, "salt".		






Name:	salammoniac			
	Class:	Halides		
	Chemistry:	(NH4) Cl		
	Color(s):	colorless, white, brownish, yellowish streak: white		
	Hardness:	1.5 - 2.0	SpecGrav:	1.5
	Fracture:	conchoidal	Cleavage:	poor
	Crystal:	cubic - often in aggregates, crusty or scaley coverings.		
	Environment:	evaporate		
	Association:	phosphorite		
	Locals:	Russia Iceland Ca., Hw., USA Italy		
	Misc:	The name derived from ancient alchemist's Latin name for the chemical, sal = salt		






CARBONATES

Name:	ankerite			
	Class:	Carbonates		
	Chemistry:	CaFe(CO3)2 calcium iron carbonate		
	Color(s):	clear, white, gray, yellow-brown		
	Hardness:	3.5 - 4	SpecGrav:	2.9 - 3.8
	Fracture:	uneven	Cleavage:	complete
	Crystal:	Hexagonal (often rhombohedral or trigonal)		
	Envronment:	in mineral veins often associated with sulfides		
	Association:	calcite, siderite, quartz, dolomite, galena		
	Locals:	Hungary England South Dakota, USA		
Misc:	Soluble with effervescence in dilute HCl, occasional yellowish to reddish fluorescence.			






Name:	aragonite			
Class:	Carbonates			
Chemistry:	CaCO3 Calcium Carbonate			
Color(s):	yellow, colorless, pale green, violet, brown Streak: white			
Hardness:	3.5 - 4.0	SpecGrav:	2.9 - 3.0	
Fracture:	subconchoidal	Cleavage:	complete 1 direction	
Crystal:	not as common as calcite, it is a high pressure polymorph, evaporative deposits in sedimentary rocks, and some metamorphic and disseminated hydrothermal deposits			
Envronment:	not as common as calcite, it is a high pressure polymorph, evaporative deposits in sedimentary rocks, and some metamorphic and disseminated hydrothermal deposits			
Association:	calcite, cerussite, lawsonite, gypsum, albite			
Locals:	Spain New Mexico, Arizona/USA Mexico Morocco			
Misc:	Named for the Spanish province of Aragon, Spain where it was first discovered, soluble in HCl with effervescence			




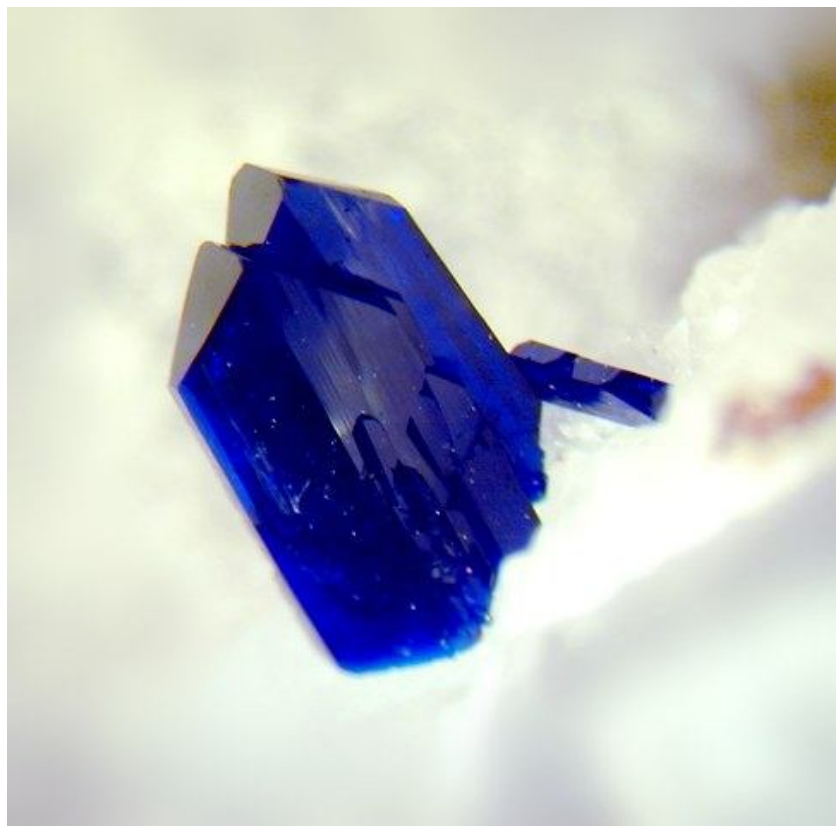


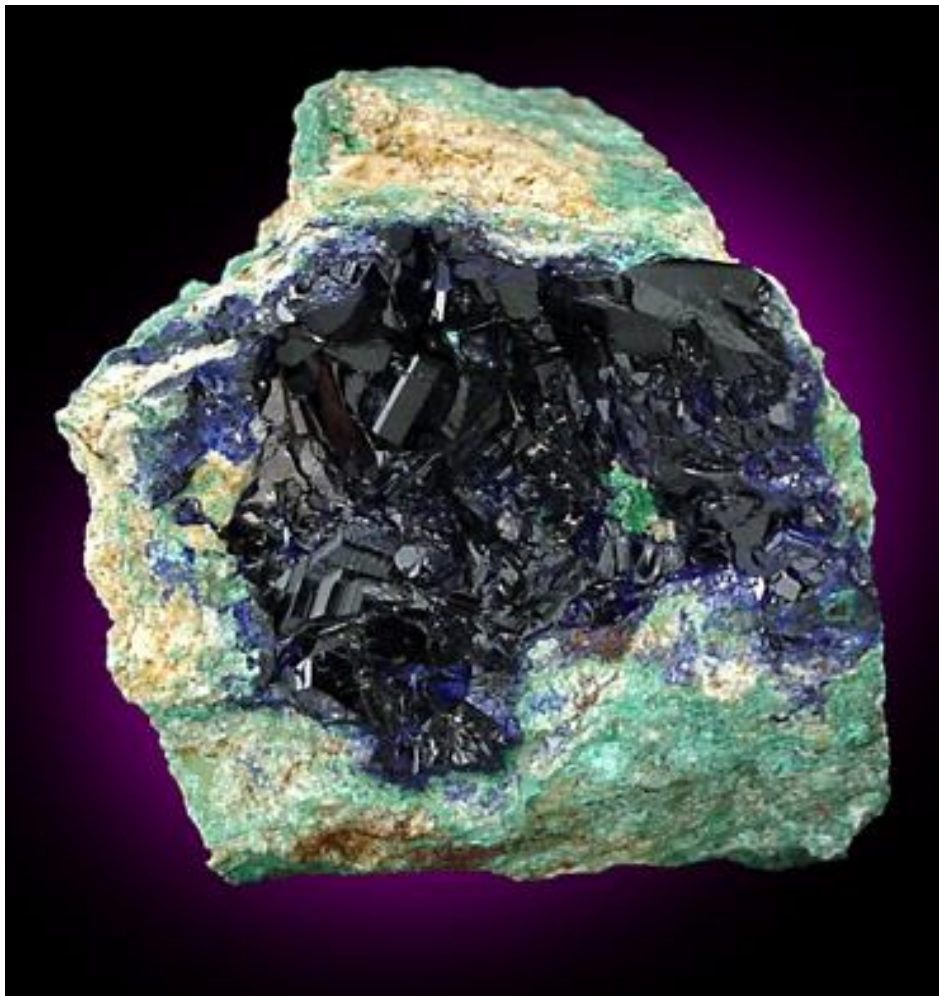
Name:	artinite		
Class:	Carbonates		
Chemistry:	Mg2(CO3)(OH)2*3 H2O hydros magnesium carbonate		
Color(s):	white or gray		
Hardness:	2 - 2.5	SpecGrav:	2.03
Fracture:	brittle	Cleavage:	complete
Crystal:	monoclinic (generally in clusters of fine needles or as a crust in veins)		
Envronment:	a very low temperature hydrothermal mineral.		
Association:	serpentines, talc, hydromagnesite, brucite		
Locals:	Italy Austria Calif., New York, USA		
Misc:	It easily is soluble in dilute acids with effervescence, and can be heated to lose water and carbon dioxide, but it does not fuse. It was discovered in 1902 in Italy, and named after researcher, Ettore Artini.		






Name:	azurite				
	Class:	Carbonates			
	Chemistry:	Cu3(CO3)2(OH)2 copper hydroxy-carbonate			
	Color(s):	blue			
	Hardness:	3.5 - 4.0	SpecGrav:		3.7 - 3.9
	Fracture:	conchoidal	Cleavage:		perfect
	Crystal:	monoclinic (typically tabular or short prismatic)			
	Envronment:	oxidized zone in hydrothermal deposits			
	Association:	malachite, cuprite, enargite, limonite, chalcopyrite			
	Locals:	Germany France England Italy Australia Arizona, New Mexico/USA			
	Misc:	soluble in ammonia or nitric acid (bubbles). Named from "azure" meaning "blue"			






Name:	bastnasite (bastnaesite)			
	Class:	Carbonates		
	Chemistry:	Y (CO3) F		
	Color(s):	yellow, yellow-brown, reddish-brown streak: white		
	Hardness:	4.0 - 4.5	SpecGrav:	4.9 - 5.0
	Fracture:		Cleavage:	imperfect
	Crystal:	hexagonal - often prismatic		
	Environment:			
	Association:			
Locals:	N.M., USA Sweden			
Misc:	Named as the Y end member from the Bastnas Mine, Riddarhyttan, Vastmanland, Sweden. There are three minerals that make up the group Y, Ce, and La.			






Name:	calcite			
	Class:	Carbonates		
	Chemistry:	CaCO3 calcium carbonate		
	Color(s):	white, yellow, pink, red, brown, green, clear, etc.		
	Hardness:	3	SpecGrav:	2.6 - 2.8
	Fracture:	conchoidal	Cleavage:	perfect
	Crystal:	hexagonal (rhombohedral, prismatic, and virtually all other shapes in the hexagonal system and many combinations.) It can easily be cleaved to form perfect rhombohedrons.		
	Environment:	typical sedimentary mineral formed by precipitation through evaporation. Under high carbon dioxide pressure it is stable through most phases of metamorphosis, when the pressure is reduced it may dissociate into a variety of complex calcium silicates. It has been found in lava flows, and is often associated with hydrothermal veins. A very abundant mineral.		
	Association:	quartz, mica, dolomite, ore minerals, sulfides, analcime		
	Locals:	Alps France Germany Ireland England Canada Russia China Mexico Mo., Co. Tn., USA (just about everywhere)		
	Misc:	soluble in cold HCl with loss of CO2 , fluorescence under UV light several colors depending on local, high double refraction.		






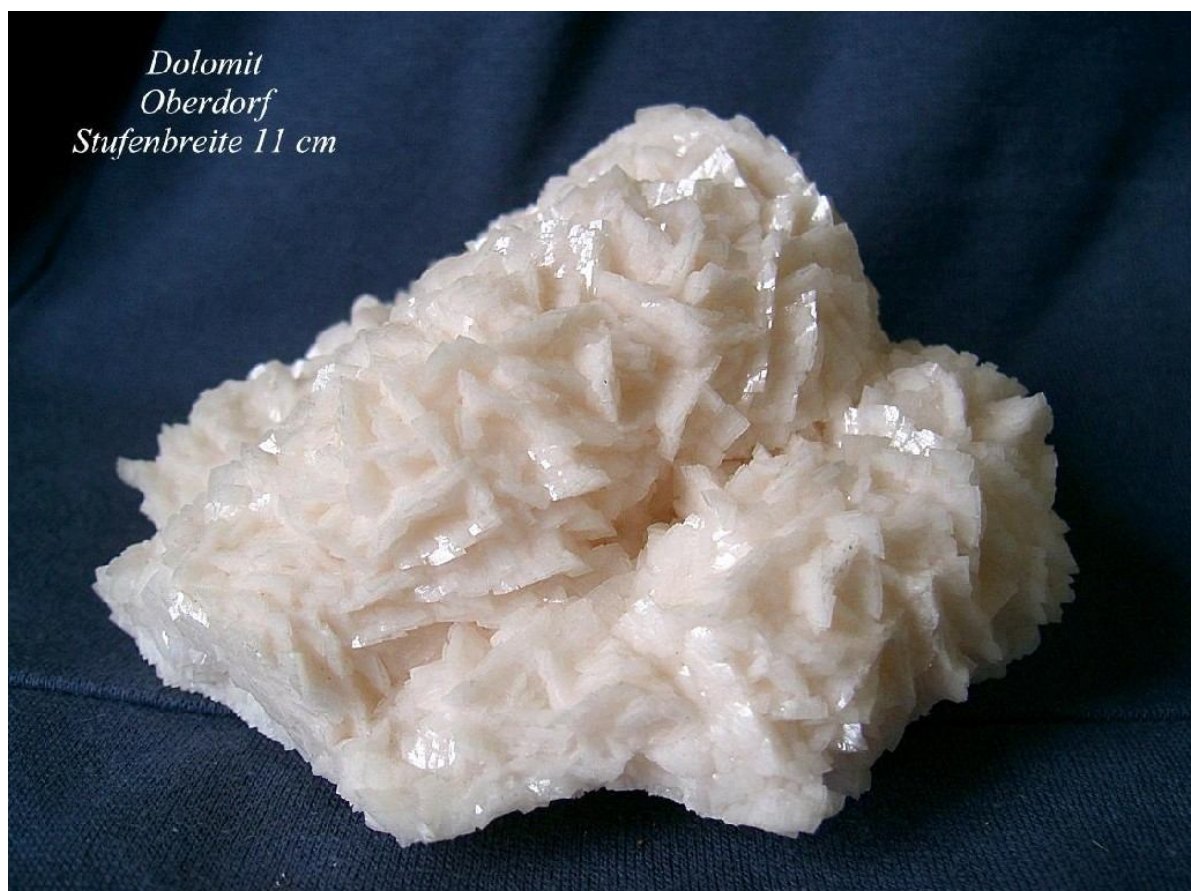
Name:	cerussite			
Class:	Carbonates			
Chemistry:	PbCO3 lead carbonate			
Color(s):	white, gray, colorless, yellow-brown, Streak:white			
Hardness:	3 - 3.5	SpecGrav:	6.4 - 6.6	
Fracture:	conchoidal	Cleavage:	incomplete	
Crystal:	Orthorhombic, (often twinned dipyramidal)			
Environment:	hydrothermal replacements			
Association:	galena, barite, anglesite, smithsonite			
Locals:	Germany Zambia Colorado, New Mexico, California/USA Australia			
Misc:	sometimes yellow fluorescence, soluble in nitric acid, the name comes from the Latin "cerussa" which means "white lead"			






Name:	dolomite			
	Class:	Carbonates		
	Chemistry:	CaMg(CO3)2 Calcium Magnesium Carbonate		
	Color(s):	Colorless, white, pink, gray, greenish, brown		
	Hardness:	3.5 - 4.0	SpecGrav:	2.85
	Fracture:	subconchoidal	Cleavage:	1 perfect
	Crystal:	Hexagonal - often twinned, simple rhombohedrons (Sometimes with curved faces), massive, aggregates.		
	Environment:	sedimentary rocks, metamorphic rocks, in hypothermal veins, and hydrothermal replacements		
	Association:	calcite, siderite, rhodochrosite, galena, gypsum		
	Locals:	CA, MI, NV, USA / Italy / Switzerland		
Misc:	Named for the French geologist, D. de Dolomieu. A series member with ankerite and with kutnohorite.			






Name:	kutnohorite			
	Class:	Carbonates		
	Chemistry:	Ca (Mn,Mg,Fe) (CO3)2] Calcium (Mixed-Metal) Carbonate		
	Color(s):	translucent, white, pink		
	Hardness:	3.5 - 4.0	SpecGrav:	3.12
	Fracture:	conchoidal	Cleavage:	perfect
	Crystal:	Trigonal (simple rombs, small needles) granular/massive		
	Environment:	hydrothermal veins, rock cavities, can form under many conditions		
	Association:	calcite, dolomite		
	Locals:	Italy Mexico New Jersey, Colorado, North Carolina, USA Japan Czechoslovakia		
	Misc:	The name Kutnohorite comes from the famous locality in Kutna Hora, Czechoslovakia, were it is found. As a carbonate it is soluble in acids.		






Name:	magnesite			
Class:	Carbonates			
Chemistry:	MgCO3 Magnesium Carbonate			
Color(s):	white, yellowish, brownish, Streak: white			
Hardness:	3.5 - 4.5	SpecGrav:	2.9 - 3.1	
Fracture:	conchoidal	Cleavage:	perfect in 3 directions	
Crystal:	hexagonal (usually rhombohedral) distinct xtals are are			
Envrionment:	at contact zone of metamorphics, with hydrothermal metamorphics, and hydrothermal replacements			
Association:	brucite, calcite, aragonite, talc, chlorite			
Locals:	Austria Italy China USSR Nevada, California / USA			
Misc:	soluble in warm HCl, sometimes fluorescence, cryptic Latin "magneus carneus", "flesh magnet"			





Name:	malachite			
Class:	Carbonates			
Chemistry:	$\text{Cu}_2\text{CO}_3(\text{OH})_2$ hydrous copper carbonate			
Color(s):	green, dark green Streak: pale green			
Hardness:	3.5 - 4.0	SpecGrav:	3.6 - 4.05	
Fracture:	conchoidal	Cleavage:	complete	
Crystal:	monoclinic (often in botryoidal masses)			
Environment:	alteration zone in hydrothermal replacements			
Association:	azurite, limonite, cuprite, chalcocite			
Locals:	Zaire France USSR Germany Chile Austrailia Arizona, New Mexico/USA			
Misc:	soluble in HCL with effervescence, from the Greek "mallow", a green herbaceous plant.			






Name:	rhodochrosite			
	Class:	Carbonates		
	Chemistry:	MnCO3 Manganese Carbonate		
	Color(s):	pink, gray, brown-black, dark red, Streak: white		
	Hardness:	3.5 - 4.0	SpecGrav:	3.4 - 3.7
	Fracture:	uneven	Cleavage:	complete
	Crystal:	hexagonal (rhombohedral xtls. common)		
	Envronment:	hydrothermal, mesothermal, & epithermal veins and hydrothermal replacements		
	Association:	rhodonite, quartz, limonite, fluorite		
	Locals:	Rumania, Peru, Colorado/Montana/Maine/ USA		
	Misc:	soluble in warm HCL, name comes from Greek phrase "rhodon chros", "rose colored"		






Name:	rosasite			
	Class:	Carbonates		
	Chemistry:	(Cu,Zn)2[(OH)2/CO3]		
	Color(s):	bluish-green		
	Hardness:	4	SpecGrav:	4.0
	Fracture:	fibrous	Cleavage:	none
	Crystal:	monoclinic; acicular, radiating fibrous needles		
	Environment:	in oxidation ore zones		
	Association:	hemimorphite, auricalcite, smithsonite		
	Locals:	AZ., NM., CA.,USA / Italy / Mexico		
	Misc:	named from the local, the Rosas mine,Sulcis, Sardinia, Italy		




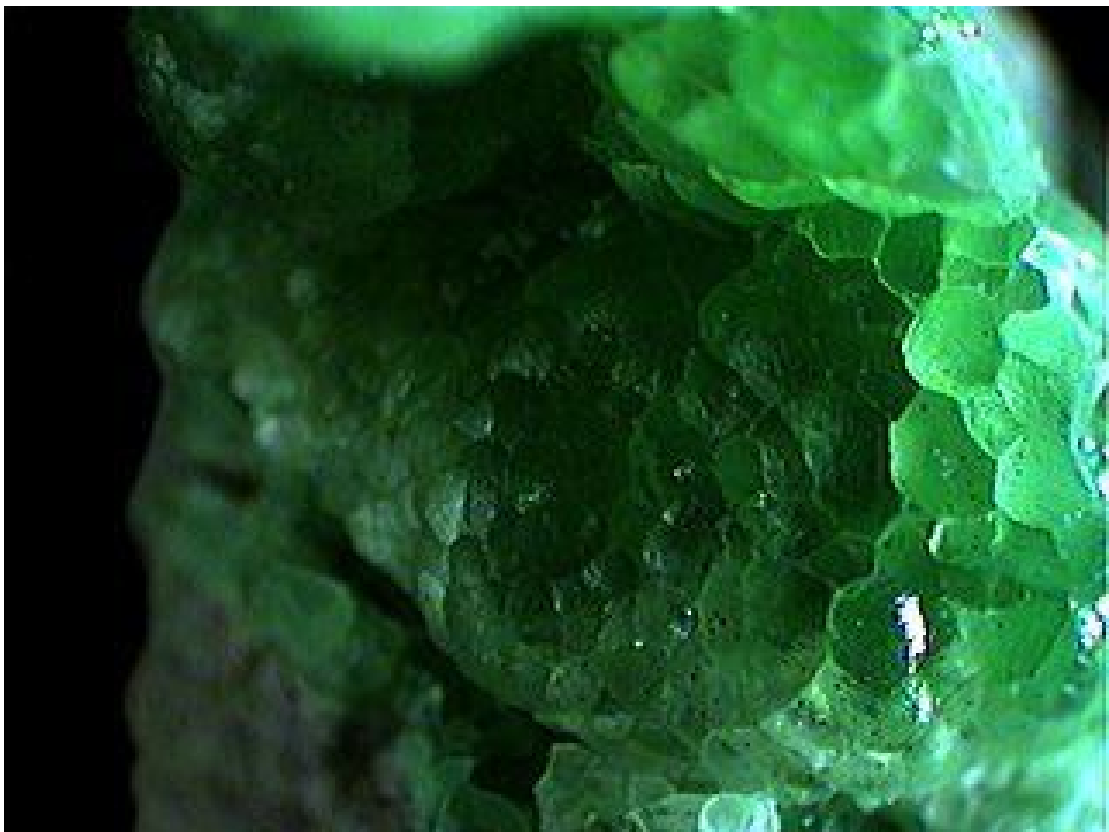


Name:	siderite			
	Class:	Carbonates		
	Chemistry:	FeCO3 Iron Carbonate		
	Color(s):	yellowish to brownish, black, occasuibakky white		
	Hardness:	4 - 4.5	SpecGrav:	3.7 - 3.9
	Fracture:	conchoidal	Cleavage:	complete
	Crystal:	Hexagonal (commonly rhombohedral, prismatic and scalenohedral. Sometimes massive.)		
	Envronment:	hypothermal veins, and hydrothermal replacements.		
	Association:	barite, calcite, galena, sphalerite, chalcopyrite		
	Locals:	Austria Germany Czechoslovakia England Spain Conn., Colorado, Az., USA		
	Misc:	The name is derived from the Greek word "sideros", meaning "iron". It is a minor ore of iron. It is soluble in warm hydrochloric acid. It often has a soft yellow fluorescence under UV light.		






Name:	smithsonite			
Class:	Carbonates			
Chemistry:	ZnCO ₃ Zinc Carbonate			
Color(s):	white, colorless, blue, green, yellow, purple, pink, brown, Streak: white			
Hardness:	4 - 5	SpecGrav:	4.3 - 4.5	
Fracture:	conchoidal	Cleavage:	complete	
Crystal:	trigonal (often pseudomorphic) usually botryoidal			
Environment:	Secondary zinc mineral forms in oxidized zone of hydrothermal replacements			
Association:	galena, cerussite, malachite, calcite, dolomite			
Locals:	Namibia Austrailia Greece Germany S.W. Africa Oklahoma, New Mexico, Arkansas/USA			
Misc:	soluble in warm acid (bubbles), named after Mineralogist James Smithson, founder of the Smithsonian Institution.			






Name:	strontianite			
Class:	Carbonates			
	Chemistry: SrCO3 Strontium Carbonate			
Color(s):	white, yellowish, greenish-gray streak: white			
	Hardness:	3.0 - 4.0	SpecGrav:	3.7 - 3.78
Fracture:	conchoidal	Cleavage:	perfect	
	Crystal: orthorhombic (prismatic, tabular, radiating fibrous, sometimes massive)			
Environment:	hydrothermal veins, fillings in chalk cavities, sometimes in limestone cavities			
	Association: galena, calcite, sphalerite, chalcopryite, dolomite, quartz			
Locals:	Scotland Switzerland Italy Germany Calif., N.Y., Pa., Illinois, Ohio, USA			
	Misc: Strontianite colors a flame crimson, it is used in fireworks to create the deep red colors. It is named for its classic locality, Strontian, Argkylshire, Scotland. Effervescence in dilute HCl, and is sometimes fluoresces blue in UV light.			






SULFOSALTS

Name:	anglesite			
	Class:	Sulfosalts		
	Chemistry:	Pb SO4 Lead Sulfate		
	Color(s):	Colorless, yellow, gray, pale green, and sometimes blue		
	Hardness:	2.5 - 3.0	SpecGrav:	6.38
	Fracture:	Conchoidal	Cleavage:	3 good
	Crystal:	Orthorhombic-thin or thick tabular common, prismatic, granular, or nodules not uncommon.		
	Environment:	alteration zone of hydrothermal deposits		
	Association:	barite, anhydrite, galena		
	Locals:	Pa., Id., Nv., USA Mexico Morocco		
Misc:	Names comes from a specific locality, Island of Anglesey, Wales. It can sometimes be fluorescent. (yellow)			






Name:	anhydrite			
	Class:	Sulfosalts		
	Chemistry:	CaSO4 calcium sulfate		
	Color(s):	white, gray, gray-blue, reddish		
	Hardness:	3 - 3.5	SpecGrav:	2.98 - 3.00
	Fracture:	uneven	Cleavage:	perfect
	Crystal:	Orthorhombic, Stocky or tabular prismatic crystals.		
	Envrionment:	sedimentary rocks and evaporative rocks. Sometimes metamorphosed from dehydrated gypsum.		
	Association:	dolomite, gypsum, sylvite, calcite		
	Locals:	Arizona, Texas, N.J., USA Brazil China Spain Italy Australia		
	Misc:	The name is derived from the Greek, ³ anhydros ² and means ³ without water ²		






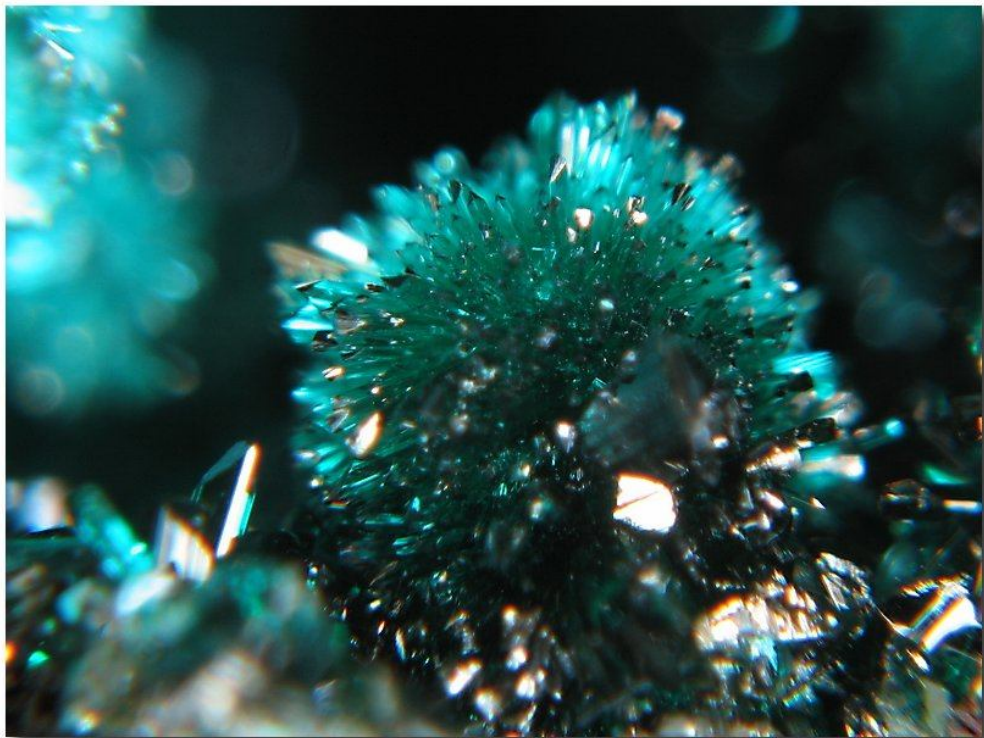
Name:	barite			
Class:	Sulfosalts			
Chemistry:	BaSO4 Barium Sulfate			
Color(s):	white, yellow, brown, red, blue, green, black, Streak: white			
Hardness:	3 - 3.5	SpecGrav:	4.3 - 4.6	
Fracture:	conchoidal	Cleavage:	complete	
Crystal:	rhombic (often tabular plates)			
Environment:	forms in mesothermal and epithermal veins and in hydrothermal replacement deposits			
Association:	cerussite, dolomite, gypsum, apatite, calcite			
Locals:	British Columbia Morocco Colorado/USA			
Misc:	soluble in concentrated sulfuric acid, alteration product is witherite, the name is from the Greek "barys" meaning "heavy"			





Name:	brochantite				
	Class:	Sulfosalts			
	Chemistry:	Cu4(SO4)€6 H2O			
	Color(s):	green, black-green			
	Hardness:	3.5-4	SpecGrav:		4.0
	Fracture:	uneven	Cleavage:		perfect one direction
	Crystal:	monoclinic; prismatic or acicular, sometimes tabular			
	Envronment:	alteration mineral in hydrothermal replacement deposits			
	Association:	malachite, azurite, atacamite,cyanotrichitechalcopyrite			
	Locals:	USSR / Romania / Italy / Spain / Az, NM, USA/ Chile			
Misc:	named after A. T. M. Brochant, mineralogist (1731-1840). This mineral is often made in the lab on a host rock and is counterfited.				




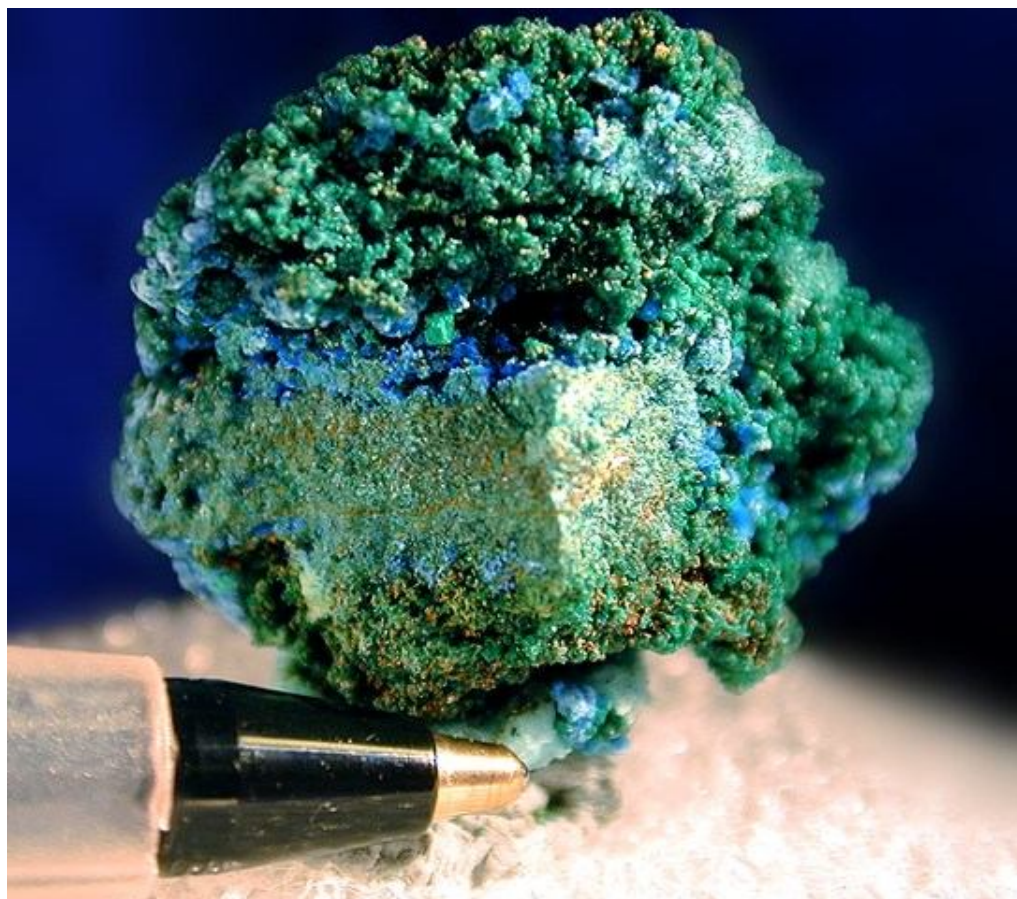


Name:	creedite				
	Class:	Sulfosalts			
	Chemistry:	Ca3 Al2 (SO4) (F,OH)10 € 2H2O			
	Color(s):	Colorless, pink, purple, white streak: white			
	Hardness:	4	SpecGrav:		2.7
	Fracture:	conchoidal	Cleavage:		1 perfect
	Crystal:	Monoclinic - often prismatic, acicular sprays, radiating groups			
	Environment:	hydrothermal deposition, and in oxidation areas of some veins.			
	Association:	quartz, barite, fluorite, gerarksutite			
	Locals:	Creede Colorado, USA			
	Misc:	Named after its original local Creede, Colorado.			






Name:	cyanotrichite			
	Class:	Sulfosalts		
	Chemistry:	$\text{Cu}_4 \text{Al}_2 (\text{SO}_4) (\text{OH})_{12} \cdot 2(\text{H}_2\text{O})$		
	Color(s):	sky blue to dark blue streak: pale blue		
	Hardness:	1-3	SpecGrav:	2.7 - 2.9
	Fracture:	uneven	Cleavage:	incomplete
	Crystal:	Orthorhombic - usually acicular crystals radiating into fibrous balls.		
	Environment:	secondary mineral in alteration zones of hydrothermal deposits.		
Association:				
Locals:	France Italy Greece Az., Ca., USA Chile			
Misc:	The name is derived from two Greek words: ³ kyanos ² and ³ thrix ² , ³ blue ² and ³ hair ² .			







Name:	ettringite			
	Class:	Sulfosalts		
	Chemistry:	Ca6Al2(SO4)4 * 24H2O Hydrous Calcium Aluminum Sulfate		
	Color(s):	clear, yellow		
	Hardness:	2-2.5	SpecGrav:	1.8
	Fracture:	uneven	Cleavage:	perfect
	Crystal:	Hexagonal (bipyramids or as fibers)		
	Environment:	found in cavities of metamorphosed limestone		
	Association:	thomsonite, clinohedrite, limestone		
	Locals:	New Jersey, Arizona, USA Ireland Germany		
	Misc:	Named from one of its early locals, Ettringen, Germany.		



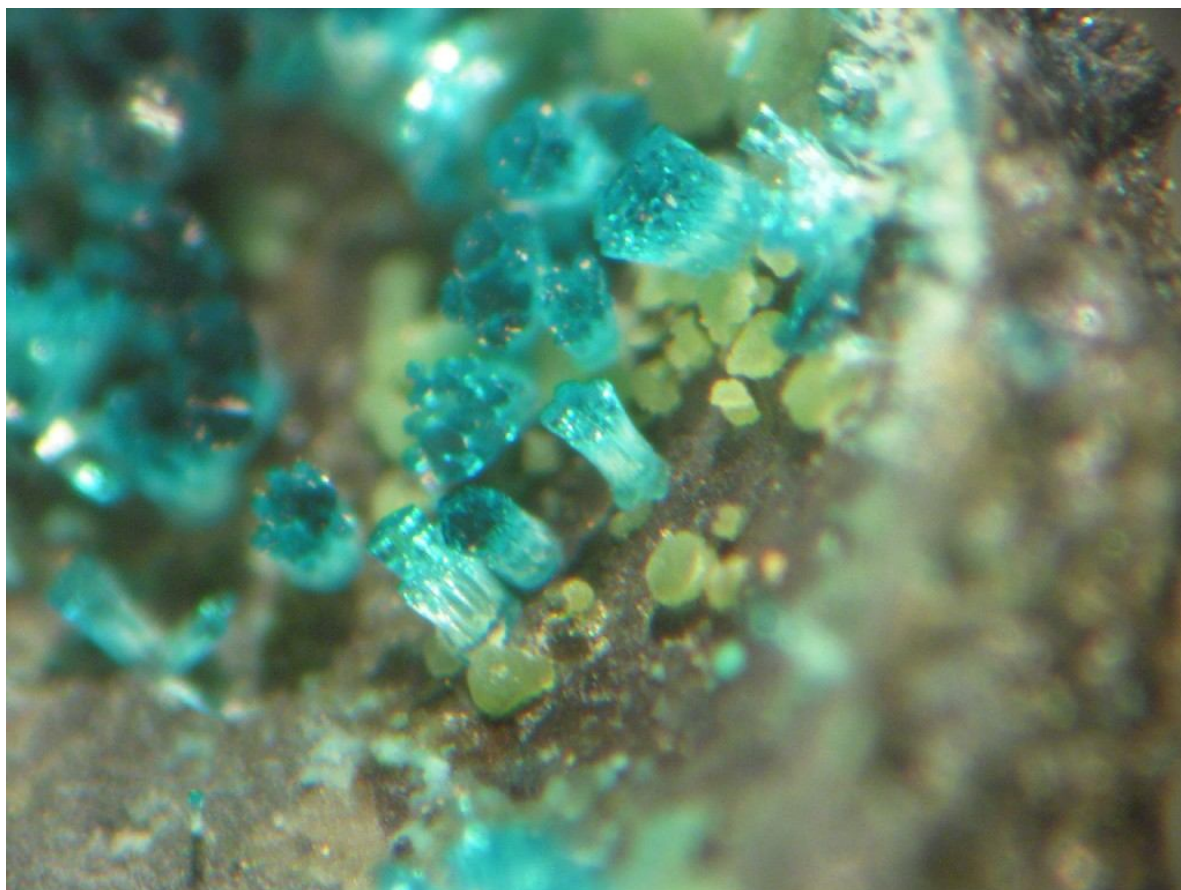


Name:	glauberite			
	Class:	Sulfosalts		
	Chemistry:	CaNa2(SO4)2 Calcium Sodium Sulfate		
	Color(s):	white, yellowish, brick-red		
	Hardness:	2.5 - 3	SpecGrav:	2.7 - 2.8
	Fracture:	uneven	Cleavage:	none
	Crystal:	a sedimentary mineral formed through evaporation		
	Envronment:	a sedimentary mineral formed through evaporation		
	Association:	halite, gypsum, anhydrite, silvenite		
	Locals:	Arizona, Calif., USA France Italy Germany Austria USSR Switzerland		
	Misc:	Soluble in water and hydrochloric acid. Can become powdery when exposed to air. Glauberite gets its name from the salt Na2(SO4) which was formerly named Glauber's Salt after the German chemist Johann Glauber.		




Name:	spangolite			
	Class:	Sulfosalts		
	Chemistry:	Cu6AlSO4(OH)12Cl € 3H2O		
	Color(s):	blue, blue-green, green, dark-green		
	Hardness:	3	SpecGrav:	3.14
	Fracture:	uneven	Cleavage:	perfect
	Crystal:	Hexagonal, thick tabular, also as crusts		
	Environment:	oxidation zones		
	Association:	serpierite, brochantite, azurite		
	Locals:	Greece / NW., USA /		
Misc:	Named after N. Spang, USA			






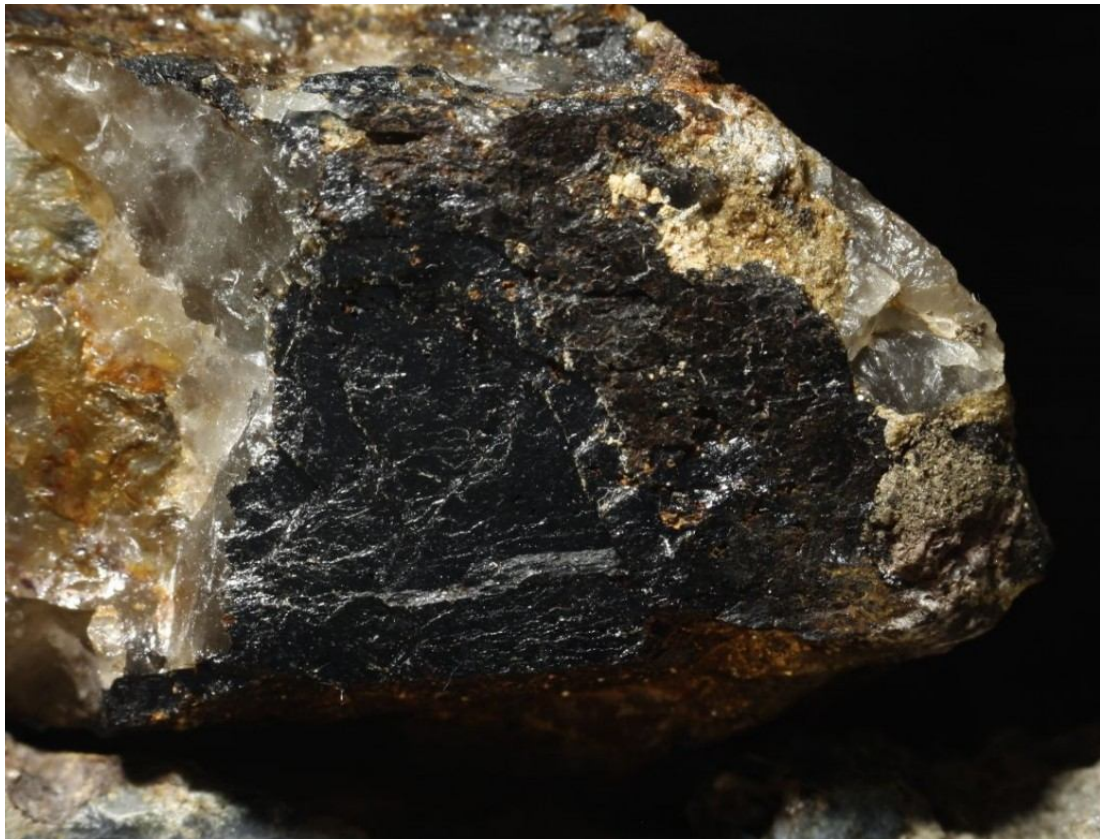
TUNGSTATES / MOLYBDATES

Name:	crocoite			
Class:	Tungstates/Molybdates			
Chemistry:	PbCrO4 lead chromate			
Color(s):	red,orange, yellow-orange Streak: orange			
Hardness:	2.5 - 3.0	SpecGrav:	5.9 - 6.1	
Fracture:	conchoidal	Cleavage:	perfect	
Crystal:	monoclinic (sometimes hallow, elongated crystals)			
Envronment:	alteration zone in hydrothermal replacements			
Association:	wulfenite, galena, cerussite, mimetite, vanadinite			
Locals:	Germany USSR Brazil Tasmania California, Arizona/USA			
Misc:	strong double refraction, soluble in HCl, from the Greek "krokos", meaning "saffron" for its strong color.			






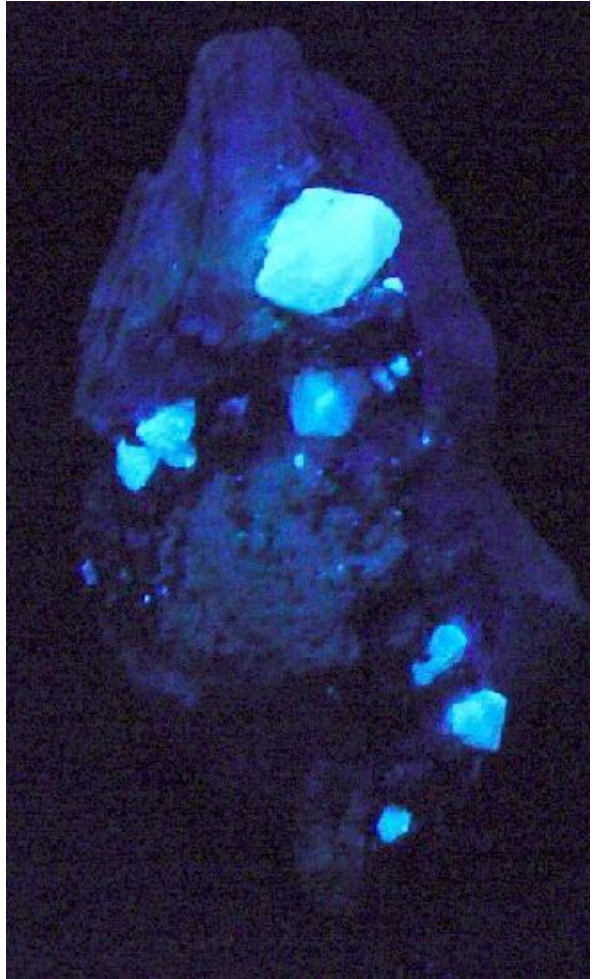
Name:	ferberite		
Class:	Tungstates/Molybdates		
Chemistry:	FeWO ₄ Iron Tungstate		
Color(s):	reddish-brown, blackish-brown, sub-metallic luster		
Hardness:	5 - 5.5	SpecGrav:	7.1 - 7.5
Fracture:	uneven	Cleavage:	perfect
Crystal:	Monoclinic, tabular crystals, vertical striations, or lamellar		
Environment:	pegmatites, and medium to high temperature hydrothermal veins		
Association:	often found with gold, silver, and nickel minerals		
Locals:	Bolivia China Canada Austrailia Colorado, USA Malaysia Netherlands		
Misc:	Insoluble in acids. It is one one end member of a solid solution where the Iron may be substituted for Manganese. Ferberite (the iron end member) and Heubnerite (MnWO ₄) is the manganese end member. The material with equal amounts of Fe and Mn is sometimes called Wolframite.		






Name:	scheelite		
Class:	Tungstates/Molybdates		
Chemistry:	CaWO ₄		
Color(s):	colorless, white, yellowish, orange-brown		
Hardness:	4.5-5	SpecGrav:	5.9-6.1
Fracture:	conchoidal	Cleavage:	difficult to distinguish
Crystal:	tetragonal; bipyramidal, less often tabular		
Environment:	in pegmatites, pneumatolytic veins, hydrothermal veins		
Association:	fluorite, cassiterite, wolframite, quartz		
Locals:	Germany / China / CA., USA / Austria / Namibia/ Brazil/ Australia		
Misc:	named for a Swedish Chemist, K. W. Scheele (1742-1786).		



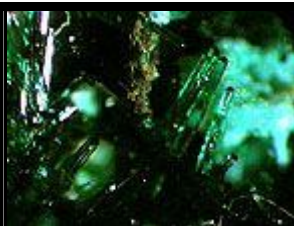


Name:	wulfenite			
Class:	Tungstates/Molybdates			
Chemistry:	PbMoO4 Lead Molybdate			
Color(s):	yellow, orange, reddish, olive-green, Streak: white			
Hardness:	3	SpecGrav:	6.5 - 7.0	
Fracture:	conchoidal	Cleavage:	incomplete	
Crystal:	Tetragonal (common square tabular)			
Envrionment:	secondary mineral in oxidizing zone of ore deposits containing lead and molybdenum			
Association:	galena, cerussite, pyromorphite, smithsonite, calcite			
Locals:	Bohemia Morocco Yugoslavia Zaire Utah, Arazona/USA Mexico Austrailia			
Misc:	slowly soluble in HCl, named for Franz Xaver Wulfen an Austrian Jesuit priest. His interest in creation resulted in his becoming a expert in many lead ores.			






OXIDE / HYDROXIDE

Name:	atacamite			
	Class:	Oxide/Hydroxides		
	Chemistry:	Cu2(OH)3Cl copper chloro-hydroxide		
	Color(s):	green, green-black, Streak: apple green		
	Hardness:	3 - 3.5	SpecGrav:	3.76
	Fracture:	conchoidal	Cleavage:	complete
	Crystal:	oxidation zone of copper deposits, especially under desert saline conditions		
	Environment:	oxidation zone of copper deposits, especially under desert saline conditions		
	Association:	malachite, cuprite, hematite, limonite, gypsum, brochantite		
	Locals:	Italy England USSR Namibia California, Arizona/USA Mexico Peru Chile Bolivia		
Misc:	Soluble in HCl and ammonia. Named from the Atacama Desert of Northern Chile where it was first discovered.			






Name:	bixbyite			
	Class:	Oxide/Hydroxides		
	Chemistry:	(Mn,Fe)2O3 manganous iron oxide		
	Color(s):	black with bronze colored glint		
	Hardness:	6 - 6.5	SpecGrav:	4.9 - 5.0
	Fracture:	uneven	Cleavage:	incomplete
	Crystal:	Cubic (usually cubes, sometimes with penetration twins) crystals have a brilliant metallic luster		
	Envronment:	forms in siliceous volcanic rocks		
	Association:	topaz, hematite, garnet, red beryl		
	Locals:	Utah, Arizona, USA Mexico Argentina India India South Africa		
Misc:	Name comes from the mineral collector, Maynard Bixby, and it was first found in the Thomas and Wah Wah Mtns. of Utah.			






Name:	brookite			
Class:	Oxide/Hydroxides			
Chemistry:	TiO2			
Color(s):	dark brown to greenish brown streak: brown-white			
Hardness:	5.5 - 6	SpecGrav:	3.9 - 4.1	
Fracture:	uneven	Cleavage:	poor	
Crystal:	orthorhombic - platy, complex crystals form id elongated in one direction, Can form pseudo hexagonal looking crystals.			
Envronment:				
Association:	chalcopyrite, hematite, anatase, rutile, quartz, feldspars, sphene			
Locals:	Austria England Switzerland Russia Arkansas, New York, Montana, USA			
Misc:	Named for the English mineralogist Henry James Brucke (1771-1857)			






Name:	cassiterite			
	Class:	Oxide/Hydroxides		
	Chemistry:	SnO2 Tin Oxide		
	Color(s):	brown to black, rarely reddish, yellow, gray, colorless		
	Hardness:	7	SpecGrav:	6.8 - 7.1
	Fracture:	conchoidal	Cleavage:	uneven
	Crystal:	Tetragonal (short columnar or acicular common)		
	Envronment:	pegmatite veins, deposited from hydrothermal fluids		
	Association:	quartz, flourite, topaz, wolframite, sphalerite, pyrite		
	Locals:	California, Alaska, South Dakota, USA Bolivia Mexico Nigeria Thailand Sumatra		
	Misc:	Probably from the ancient Phoenician name for the northern Mediterranean Island, the "cassiterides". Tin was mined and imported from these island in ancient times. It has the same structure as rutile (TiO2).		






Name:	chalcotrichite (cuprite)			
	Class:	Oxide/Hydroxides		
	Chemistry:	CuO2 copper oxide		
	Color(s):			
	Hardness:	3.5 - 4.0	SpecGrav:	6.1
	Fracture:	brittle	Cleavage:	imperfect
	Crystal:	cubic - fibrous form of cuprite		
	Environment:	in the oxidation zones of copper deosits.		
	Association:	limonite, copper, malachite		
	Locals:	Az., N.M., Wy., USA Germany France England		
	Misc:	Chalcotrichite from the Greek, meaning "hairy copper."		






Name:	chrysoberyl		
Class:	Oxide/Hydroxides		
Chemistry:	BeAl2O4		
Color(s):	yellow-green, green, brown, greenish-white		
Hardness:	8.5	SpecGrav:	3.5-3.8
Fracture:		Cleavage:	good one direction poor in two
Crystal:	orthorhombic; usually tabular or prismatic, often twinned in circular (six-sided) shapes.		
Environment:	granite pegmatites, shists, and a few other metamorphics		
Association:	microcline, tourmaline,albite, almandite, garnet, spinel		
Locals:	Sweden / USSR/ Sri Lankra / Burma / Brazil / China/		
Misc:	from the Greek, chrysos and beryllon, relating to beryl and its golden yellow color. It was once considered a variety of beryl.		




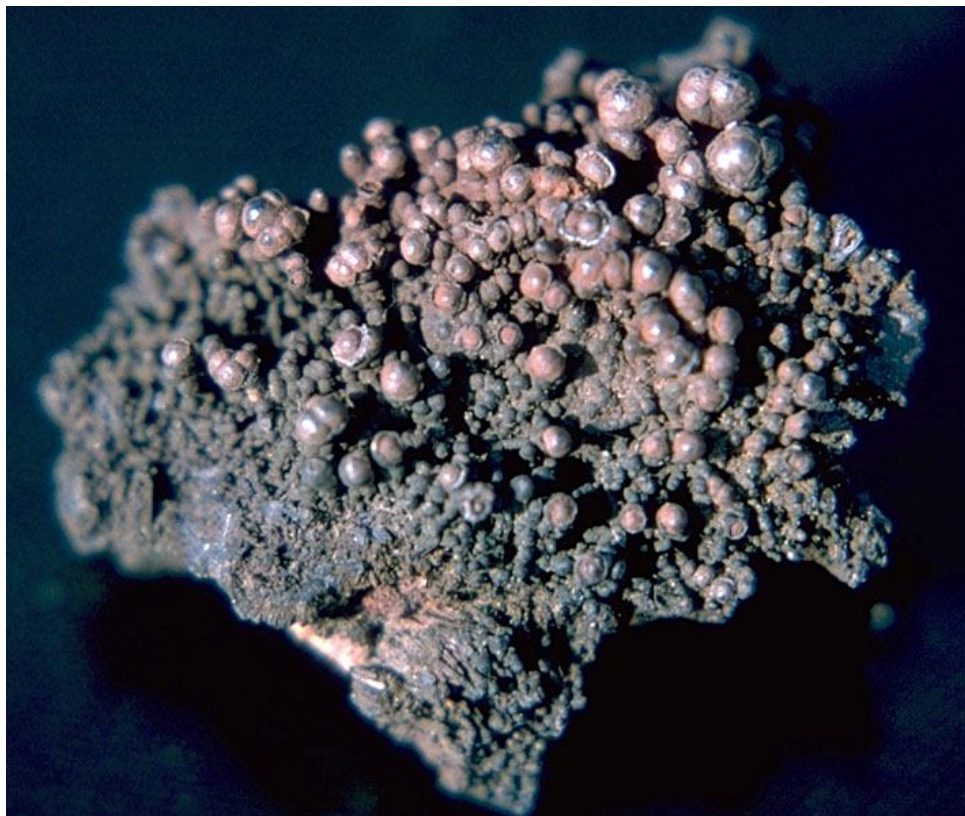


Name:	corundum		
Class:	Oxide/Hydroxides		
Chemistry:	Al ₂ O ₃		
Color(s):	red (ruby), blue (sapphire), gray, black, yellow, purple, (just about all colors) streak: white		
Hardness:	9	SpecGrav:	3.9 - 4.1
Fracture:	tough	Cleavage:	none
Crystal:	hexagonal		
Environment:	in pegmatites, in contact metamorphics, and in other metamorphic terrains.		
Association:			
Locals:	Burma China Sri Lanka NC, Mo., USA		
Misc:	The name comes from the ancient Sanskrit, ³ kuruvinda ² meaning ³ ruby ² . It is derived from the Tamil ³ kuruntam ² , which also came from the Sanskrit. Do to its hardness it is also used as an abrasive.		






Name:	cryptomelane			
	Class:	Oxide/Hydroxides		
	Chemistry:	KMn8O16 potassium manganese oxide		
	Color(s):	steel gray to bluish black, sometimes dull gray or sub-metallic		
	Hardness:	6 - 6.5	SpecGrav:	4.36
	Fracture:	conchoidal	Cleavage:	unknown
	Crystal:	Monoclinic, pseudo tetragonal, often botryoidal, fine grained or fibrous.		
	Envronment:	secondary mineral in manganese ore deposits		
	Association:	pyrolusite, manganite		
	Locals:	N.C., Arkansas, Arizona, Montana, USA S. Africa Ghana Brazil Australia		
Misc:	Part of a series of minerals with the general formula AB8O16 where the A represents, Ba, K, Na, Pb, Sr, Y, and the B is taken from the list, Cr, Fe, Mg, Mn, Ti, and V. The minerals include, Coronadite, Priderite, Hollandite, Manjiroite, Mannardite, and Redledgeite.			






Name:	cuprite (chalcotrichite)			
Class:	Oxide/Hydroxides			
Chemistry:	CuO2 copper oxide			
Color(s):	deep red, carmine red, red-brown, sometimes gray-black			
Hardness:	3.5 - 4	SpecGrav:	5.8 - 6.2	
Fracture:	conchoidal	Cleavage:	complete	
Crystal:	Isometric (often octahedral and twinned,surface growths, sometimes acicular) fibrous material often called chalcotrichite			
Envronment:	found in oxidized zone of copper deposits, hydrothermal sulfide veins, and sometimes in aggregates.			
Association:	copper, malachite, azurite, chrysocolla, limonite			
Locals:	Tennessee, Arizona, USA Bolivia Mexico Japan Australia Germany			
Misc:	Scientific name comes from the Latin "cuprum", meaning copper. It's nickname is "ruby copper" from old miners. Pseudomorphs of malachite after cuprite a fairly common.			






Name:	goethite			
Class:	Oxide/Hydroxides			
Chemistry:	FeOOH Hydrous Iron Oxide			
Color(s):	brown, yellow, gray, metallic			
Hardness:	4 - 5.5	SpecGrav:	3.8 - 4.3	
Fracture:	uneven	Cleavage:	complete	
Crystal:	Orthorhombic (often globular masses, prismatic or tabular crystals.)			
Envronment:	found in oxidized zone of sulfide ore deposits			
Association:	hematite, pyrite, calcite, quartz, lepidocrocite			
Locals:	Alabama, Michigan, Colorado, USA Germany England France Canada			
Misc:	Named in honor of the German poet, Johann Wolfgang von Goethe. Goethite is the major constituent of rust, and an important ore of iron. It is also the primary constituent of limonite, which is a catchall name for a variety of mixed iron oxides.			






Name:	hausmannite			
	Class:	Oxide/Hydroxides		
	Chemistry:	Mn3O4		
	Color(s):	brown t- reddish		
	Hardness:	5.5	SpecGrav:	4.5-4.8
	Fracture:	uneven	Cleavage:	perfect
	Crystal:	tetragonal; pseudo-octahedral, massive,		
	Envronment:	metamorphic manganese deposits, lining hydrothermal veins		
	Association:	braunite, manganite, pyrolusite, psilomelane, barite		
	Locals:	Germany / England / Bulgaria / Sweden / Switzerland / USSR / NV., USA / Brazil / India		
Misc:	after the German mineralogist J. F. L. Hausmann (1782-1859)			






Name:	hematite			
Class:	Oxide/Hydroxides			
Chemistry:	Fe2O3 Iron Oxide			
Color(s):	gray-metallic, black, reddish-gray, reddish-brown			
Hardness:	5.5 - 6.5	SpecGrav:	5.2 - 5.3	
Fracture:	conchoidal	Cleavage:	none	
Crystal:	Hexagonal (often botryoidal masses, thin needles, tabular) grows in a wide variety of forms			
Envronment:	accessory mineral in many igneous and metamorphic rocks.			
Association:	magnetite, pyrite, siderite, limonite, calcite, quartz			
Locals:	Great Lakes Region, Many Western States, USA Canada Italy Brazil Switzerland			
Misc:	It's name is taken from the Greek word "haima", for "blood". It is still sometimes referred to as "bloodstone" do to its red streak. It is often made into beads or jewelry as it polishes to good metallic gray finish.			






Name:	latrappite			
Class:	Oxide/Hydroxides			
Chemistry:	$(\text{Ca}, \text{Na})(\text{Nb}, \text{Ti}, \text{Fe})\text{O}_3$			
Color(s):	dark-metallic streak: gray			
Hardness:	5.5	SpecGrav:	4.4	
Fracture:		Cleavage:	none	
Crystal:	Orthorhombic; dipyramidal Pseudo Cubic - Crystals show a cubic outline., Twinning Common			
Environment:				
Association:				
Locals:	Canada			
Misc:	Name comes from the local, La Trappe, Oka, Québec, Canada			






Name:	limonite			
	Class:	Oxide/Hydroxides		
	Chemistry:	$\text{FeOOH} \cdot n \text{H}_2\text{O}$		
	Color(s):	yellow, brown, glassy,		
	Hardness:	4-5.5	SpecGrav:	2.7-4.3
	Fracture:	conchoidal, uneven	Cleavage:	none
	Crystal:	Amorphous, fibrous, botryoidal - limonite is not really a mineral but rather a mixture of hydrated goethite.		
	Environment:	a mixture of secondary iron minerals, alteration product of iron ores, especially sulfides		
	Association:	pyrite, hematite, prolusite, psilomelane, calcite, quartz		
	Locals:	Germany / France / Luxembourg / Italy / USSR/ Cuba/ Brazil / Zaire / India/ USA		
Misc:	named from the Greek, leimons, meaning "meadow". Because it often was found in bogs. It is actually a Cryptocrystalline goethite with water.			





Name:	magnetite			
	Class:	Oxide/Hydroxides		
	Chemistry:	Fe3O4 Iron Oxide		
	Color(s):	Metallic, opaque, Streak: black		
	Hardness:	5.5 - 6.5	SpecGrav:	5.2
	Fracture:	conchoidal	Cleavage:	incomplete
	Crystal:	Cubic (crystals are often octahedral)		
	Environment:	it occurs in many igneous rocks and is the most abundant metal oxide		
	Association:	andradite, calcite		
	Locals:	France, Germany Norway Finland Brazil Michigan, Utah/USA		
Misc:	The name comes from the the ancient name Magnesia, in Asia, an ancient region bordering on Macedonia. It is now in Turkey.			






Name:	pseudobrookite			
	Class:	Oxide/Hydroxides		
	Chemistry:	Fe2TiO5		
	Color(s):	black metallic streak:brownish green		
	Hardness:	6	SpecGrav:	4.4
	Fracture:	conchoidal	Cleavage:	indistinct
	Crystal:	monoclinic, often radiating crystal masses - acicular		
	Envronment:			
	Association:	hornblende, tridymite, hematite, bixbyite, spessartine, pyroxenes, and topaz.		
	Locals:	Transylvania, Romania Thomas Range, Utah, USA		
Misc:				






Name:	pyrolusite				
	Class:	Oxide/Hydroxides			
	Chemistry:	MnO2 Manganese Oxide			
	Color(s):	steel gray to iron black			
	Hardness:	6 - 6.5	SpecGrav:		4.9 - 5.1
	Fracture:	uneven	Cleavage:		complete
	Crystal:	Tetragonal (prismatic, often radiating fibrous)			
	Envrionment:	secondary manganese deposits, and secondary veins. Forms under oxidizing conditions			
	Association:	Manganite, psilomelane, limonite			
	Locals:	Germany Ukraine S. Africa Brazil Michigan,Arkansas/USA			
	Misc:	found as tubers on deep ocean floors, it is the main ore of manganese. Soluble in HCL. The name is derived from the Greek, and translated as "fire wash", as it was added to glass to remove iron stain.			






Name:	rutile			
	Class:	Oxide/Hydroxides		
	Chemistry:	TiO2 Titanium Dioxide		
	Color(s):	yellow to dark brown, reddish, black		
	Hardness:	6.0	SpecGrav:	4.2 - 4.3
	Fracture:	conchoidal	Cleavage:	complete
	Crystal:	tetragonal (prismatic thick columns, sometimes fine wire-like structures in quartz or topaz, often vertical stripes) often twinned		
	Environment:	present in metamorphic rocks, pegmatites, basic magmatites.		
	Association:	brookite, anatase, hematite, quartz, topaz, apatite, titanite		
	Locals:	Austria Urals Norway Switzerland Mexico Brazil Georgia /USA		
	Misc:	The name is from the Latin "rutilus", which means "golden-red". There are three polymorphs of Titanium Dioxide, rutile, anatase, and brookite. Rutile is by far the most common. It is an important ore of titanium.		






Name:	spinel			
Class:	Oxide/Hydroxides			
Chemistry:	MgAl2O4 Magnesium Aluminum Oxide			
Color(s):	red, green, blue, black, brown			
Hardness:	7.5 - 8.0	SpecGrav:	3.6 - 4.0	
Fracture:	conchoidal	Cleavage:	incomplete	
Crystal:	Isometric (often in octahedrons and cubes, also sometimes compact and granular)			
Environment:	forms in metamorphic rocks			
Association:	zircon, garnet,magnetite, calcite, corundum			
Locals:	Germany Sweden USSR Burma India New York, Calif, New Jersey, USA Canada			
Misc:	The name is probably from the Latin "spina", meaning "thorn". This is because it sometimes forms in small, sharp little crystals, resembling thorns.			






BORATES

Name:	hilgardite			
	Class:	Borates		
	Chemistry:	Ca2 B5O9 Cl · H2O		
	Color(s):	colorless, red-orange streak: white		
	Hardness:	5	SpecGrav:	2.7
	Fracture:		Cleavage:	perfect 2 directions
	Crystal:	Triclinic		
	Environment:			
	Association:	other borates, boracite		
	Locals:	LA, USA England		
Misc:	Images 1-4 contain orange hilgardite on white boracite.			






Name:	rhodizite			
	Class:	Borates		
	Chemistry:	(K,Cs) Al4 Be4 (B,Be)12 O28		
	Color(s):	colorless, grayish, yellow, yellowish white, or white streak: white		
	Hardness:	8.0 - 8.5	SpecGrav:	3.44
	Fracture:	conchoidal	Cleavage:	indistinct
	Crystal:	Isometric - dodecahedral crystals and embedded grains		
	Environment:	found in pegmatites		
	Association:			
	Locals:	England russia Madagascar		
Misc:	From the Greek: "RHIDIZEIN", meaning rose colored alluding to a flame. It is piezoelectric.			






ELEMENTS

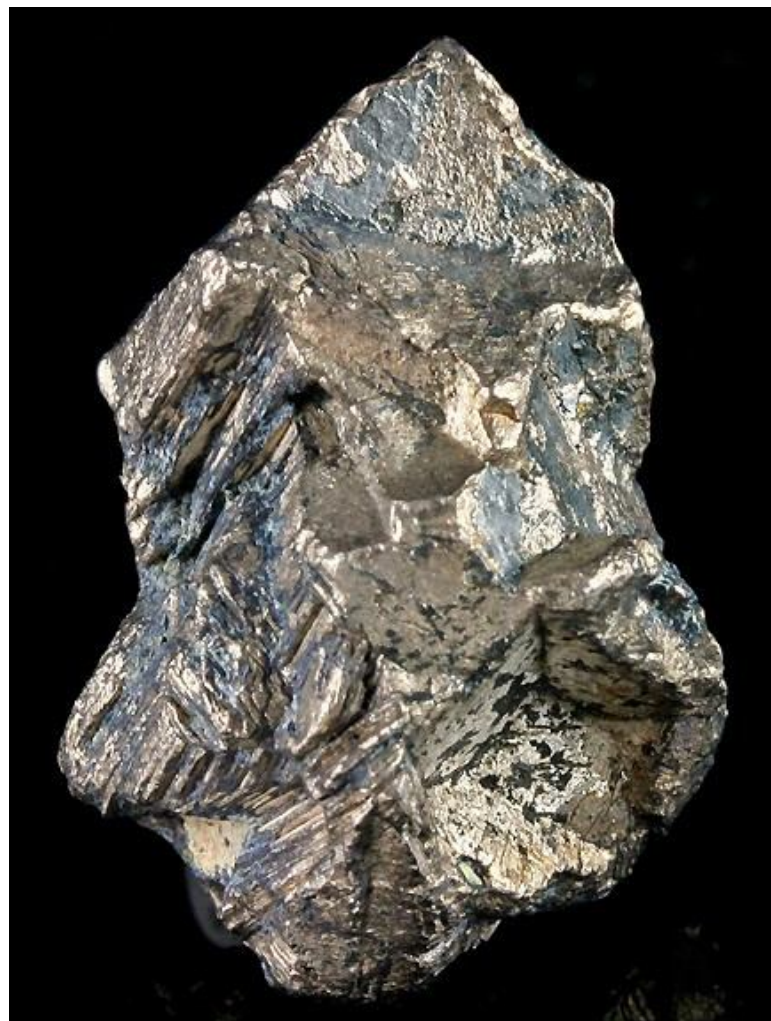
Name:	antimony			
	Class:	Native Element		
	Chemistry:	Sb		
	Color(s):	silver gray - metallic		
	Hardness:	3.0 - 3.5	SpecGrav:	6.60 - 7.2
	Fracture:	brittle	Cleavage:	perfect
	Crystal:	trigonal - often massive lamellar, forms large masses		
	Envronment:	most often found in mesothermal veins		
	Association:	stibnite, nickeline, sphalerite		
	Locals:	Ca., USA Mexico Canada		
	Misc:	From the Arabic, ³ al-uthmud ² , tthen from the Medieval Latin, ³ antimonium ² ; originally applied to stibnite, antimony sulfide		





Name:	bismuth			
Class:	Native Element			
Chemistry:	Bi			
Color(s):	gray, metallic			
Hardness:	2.0 - 2.5	SpecGrav:	9.7 - 9.8	
Fracture:		Cleavage:	good	
Crystal:	hexagonal but quite rare, often in lamular groups.			
Envronment:	in pegmatites, hypothermal and mesothermal veins, and hydrothermal replacements			
Association:	bismuthinite, quartz, gold, cassiterite			
Locals:	germany Sweden Canada S.C., USA Mexico			
Misc:	Named from the German ³ Wismut ² of unknown origin or perhaps from the Arabic, ³ biismid ² , meaning ³ having the properties of antimony ² .			





Name:	gold			
	Class:	Native Element		
	Chemistry:	Au		
	Color(s):	brass yellow, light yellow, metallic		
	Hardness:	2.5-3	SpecGrav:	15.6-19.3
	Fracture:		Cleavage:	none
	Crystal:	Isometric; octahedral, dodecahedral, cubic ...often distorted as nuggets		
	Environment:	veins in hydrothermal deposits, and hydrothermal replacements		
	Association:	quartz, pyrite, sphalerite, magnetite, tourmaline		
	Locals:	Austria / Australia / South Africa / USSR / USA / Canada		
Misc:	the name may be Anglo-Saxon, but the origin is unknown or uncertain.			






Name:	silver			
	Class:	Native Element		
	Chemistry:	Ag		
	Color(s):	metallic, silver, gray		
	Hardness:	2.5 - 3.0	SpecGrav:	10.1 - 11.1
	Fracture:	hackly	Cleavage:	noe
	Crystal:	Isometric, crystals are rare, massive, also wire forms		
	Environment:	volcanic rocks, veins, mixtures with copper, wires, hypothermal veins		
	Association:	copper, chalcocite, lead, quartz		
	Locals:	Nv., Mi., Az., Co., USA Mexico Norway		
	Misc:	it is both maleable and ductile. The origin of the name is not known.		





Name:	sulfur			
	Class:	Native Element		
	Chemistry:	S8		
	Color(s):	yellow, brownish black, Streak: white		
	Hardness:	2	SpecGrav:	2.0 - 2.1
	Fracture:	conchoidal	Cleavage:	incomplete
	Crystal:	Orthorhombic (bipyramidal, sometimes tabular) often as a crust		
	Envronment:	usually from a direct sublimation process from a vents or fumarols		
	Association:	cinnabar, stibnite, calcite, gypsum, halite		
	Locals:	Italy Wyoming, Utah, California/USA Japan Indonesia USSR		
	Misc:	The origin of the name is unknown, but it was known in ancient times.		






SULFIDES

Name:	acanthite (argentite)			
Class:	Sulfides			
Chemistry:	Ag ₂ S			
Color(s):	lead-gray to black - metallic			
Hardness:	2-2.5	SpecGrav:	7.2-7.4	
Fracture:	hacky	Cleavage:	indistinct	
Crystal:	isometric, crystals rare - cubes; octahedrons - often in parallel groups			
Environment:	hydrothermal replacement deposits			
Association:	barite, bornite, galena and quartz			
Locals:	Kongsberg, Norway / Pachuca, Guanajuato, Mexico / Aspen, Leadville, Co., Nv., USA			
Misc:	Named for the Greek word for thorn, akantha. Derived from the crystal form. Argenite comes from the Latin, arentum. meaning silver.			





Name:	arsenopyrite			
	Class:	Sulfides		
	Chemistry:	FeAsS iron arsenic sulfide		
	Color(s):	Silverish, whiteish-gray, metallic		
	Hardness:	5.5 - 6	SpecGrav:	5.9 - 6.2
	Fracture:	uneven	Cleavage:	one distinct
	Crystal:	Monoclinic, elongated prismatic crystals with striations, twinning is common		
	Envronment:	in sulfide ore deposits, common in medium to high temperature hydrothermal veins. Frequently in metamorphic deposits.		
	Association:	often found with gold, silver, and nickel minerals		
	Locals:	Bolivia Mexico Canada Hungary Colorado, Conn., USA England Norway		
	Misc:	The most common mineral containing Arsenic, it is soluble in Nitric Acid, yielding Sulfur. If it is struck with a metal object it produces a garlic odor. Its name is a contraction of an archaic term "arsenical pyrites".		






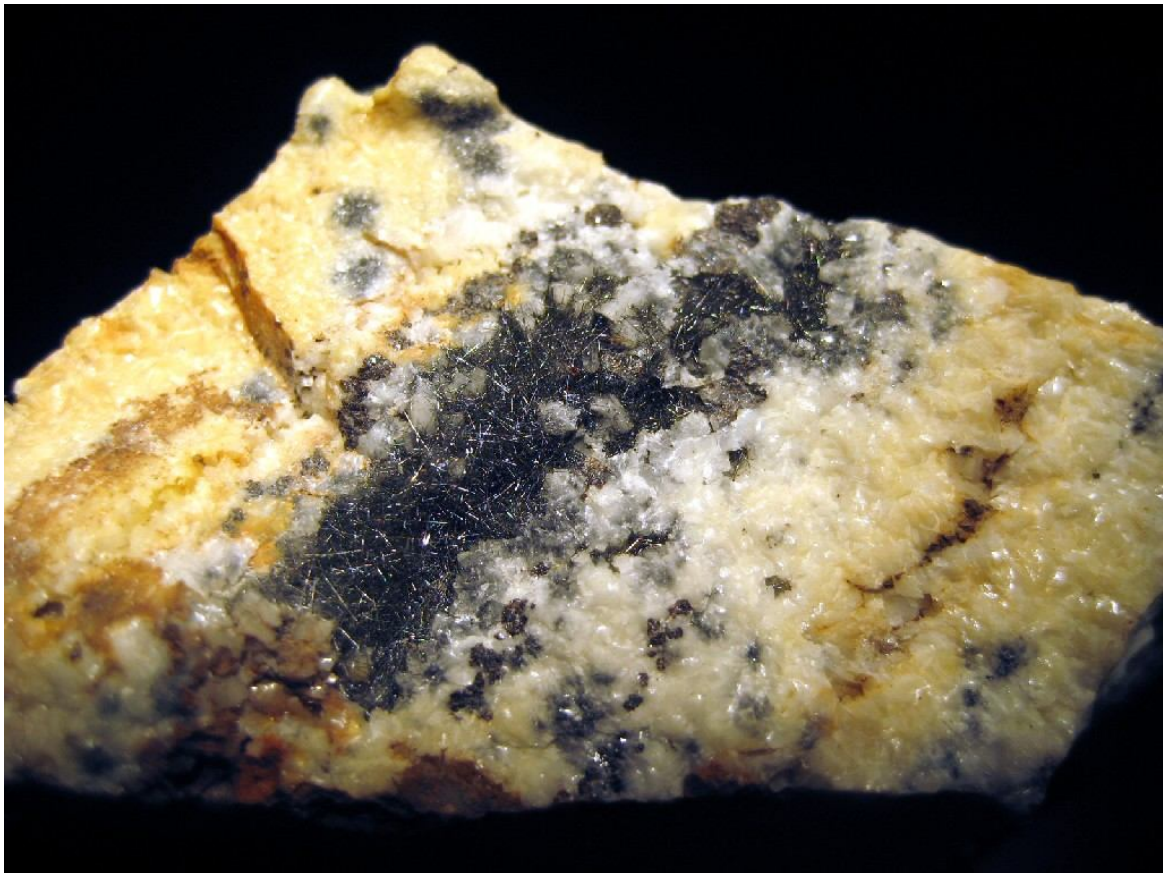
Name:	bornite			
Class:	Sulfides			
Chemistry:	Cu5FeS4			
Color(s):	copper-red, bronze-brown, tarnishes to deep blue-violet ... metallic			
Hardness:	3	SpecGrav:	4.9-5.1	
Fracture:	uneven brittle	Cleavage:	none	
Crystal:	isometric - crystals rare ... cubic, dodecahedral, octahedral			
Envronment:	can occur with carbonatites or in hydrothermal veins, and with other ores			
Association:	calcite, barite, galena, quartz, chalcopyrite, chalcocite, pyrite			
Locals:	CO, MN, AR, USA / Canada / Morocco / Germany / Poland / England / Chile			
Misc:	It was named after Ignaz vonBorn (1742-1791), mineralogist.			






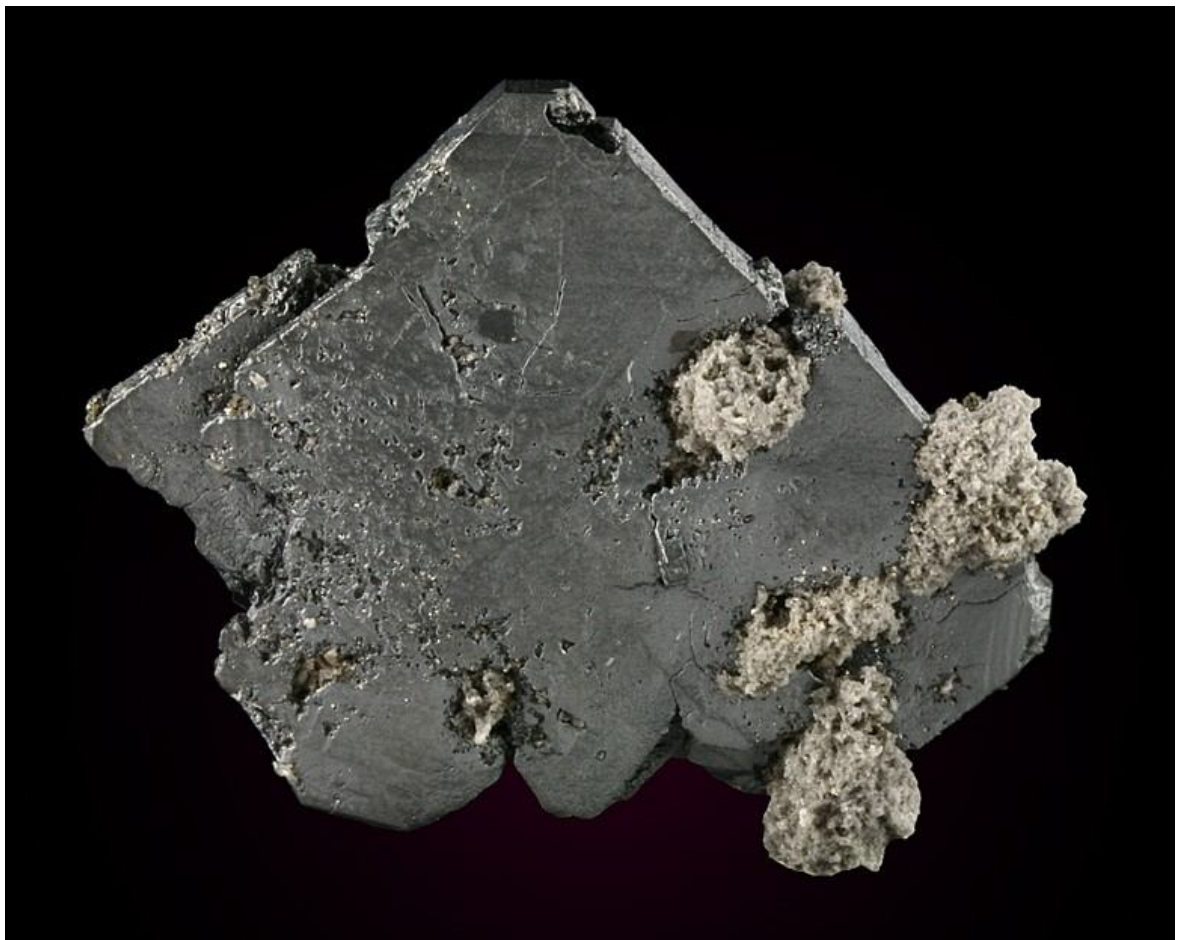
Name:	boulangerite (Mullanite)			
	Class:	Sulfides		
	Chemistry:	Pb5 Sb4 S11		
	Color(s):	mettalic lloking, gray, black streak: reddish-brown		
	Hardness:	2.5	SpecGrav:	5.7 - 6.3
	Fracture:	brittle	Cleavage:	indistinct
	Crystal:	Monoclinic - prismatic Acicular - Occurs as needle-like crystals., Massive - Fibrous		
	Environment:	present in lead-ore deposits		
	Association:	galena, stibnite, sphalerite, pyrite, quartz		
	Locals:	Germany USSR S.D., USA		
	Misc:	Named for a mining engineer, C. L. Boulanger, France.		






Name:	bournonite (endellionite)			
	Class:	Sulfides		
	Chemistry:	Pb Cu Sb S3		
	Color(s):	gray, steelish-metallic streak: grayish		
	Hardness:	3.0	SpecGrav:	5.7 - 5.9
	Fracture:	pseudo-conchoidal	Cleavage:	imperfect
	Crystal:	orthorhombic - dipyramidal, cubic looking, cog-wheel type shapes.		
	Environment:	develops in mesothermal veins		
	Association:	stibnite, galena, tetrahedrite, quartz, calcite		
	Locals:	Germany France England Co., Ca., Az., Ut., USA		
	Misc:	Named after the French mineralogist, J. L. de Bournon.		




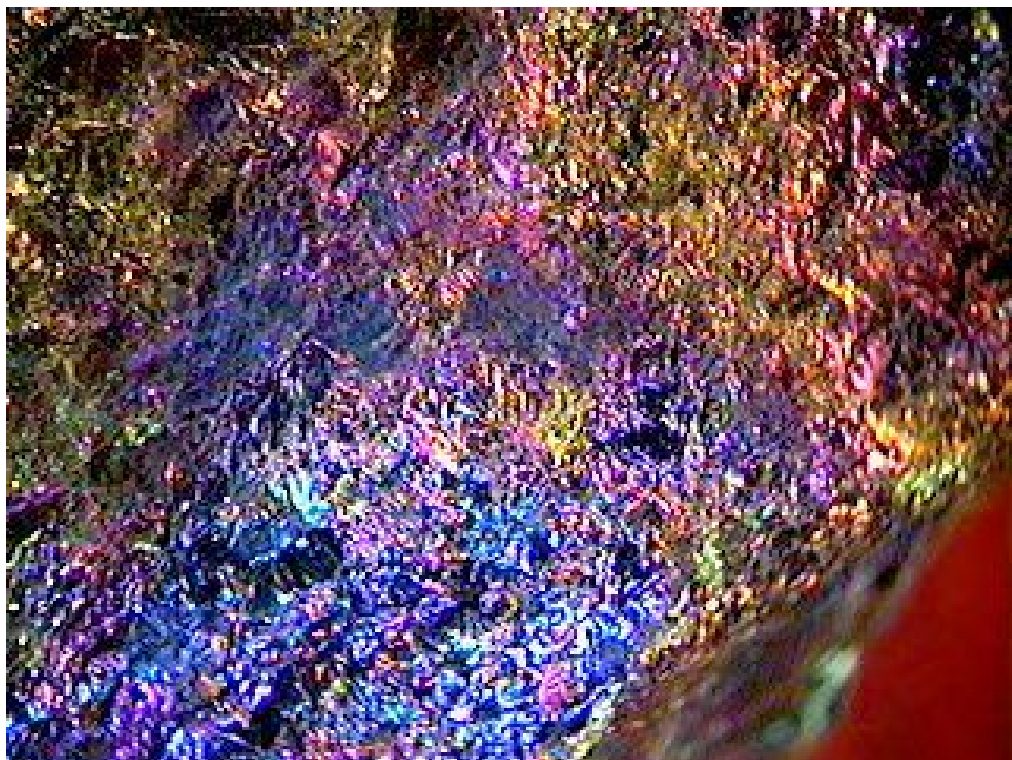


Name:	chalcocite			
	Class:	Sulfides		
	Chemistry:	Cu ₂ S copper sulfide		
	Color(s):	metallic luster, dark color usually charcoal gray or black, sometimes iridescent colors.		
	Hardness:	2.5 - 3.0	SpecGrav:	5.5 - 5.8
	Fracture:	conchoidal	Cleavage:	indistinct
	Crystal:	Orthorhombic crystals rare, tabular, hexagonal and striated.		
	Environment:	Ore veins, hydrothermal sulfide deposits		
	Association:	cuprite, azurite, malachite		
	Locals:	Montana, Arizona, USA Peru Mexico Namibia Italy		
	Misc:	The name comes from the Greek "chalcos", meaning "copper". Dissolves easily in nitric acid, and in a flame it decomposes giving off sulfur dioxide fumes.		






Name:	chalcopyrite		
Class:	Sulfides		
Chemistry:	CuFeS ₂ copper iron sulfide		
Color(s):	brass yellow, sometimes a greenish cast, sometimes an iridescent tarnish		
Hardness:	3.5 - 4.0	SpecGrav:	4.2 - 4.3
Fracture:	conchoidal	Cleavage:	incomplete
Crystal:	tetragonal (pseudo tetrahedral crystals common, sometimes massive) The pseudo tetrahedral crystals are disphenoidal.		
Environment:	High temperature hydrothermal veins, contact metamorphics		
Association:	pyrite, sphalerite, pyrrhotite, fluorite, tetrahedrite		
Locals:	France Chile Zambia Peru Germany Spain Montana, Arizona, Utah /USA		
Misc:	the word chalcopyrite means "copper pyrite", from the Greek "chalkos" meaning "copper" and the "pyrite" which had the general meaning of something that, when struck, would produce sparks. Easily distinguished from pyrite as chalcopyrite can be scratched with a steel blade and pyrite cannot.		





Name:	cinnabar			
	Class:	Sulfides		
	Chemistry:	HgS mercuric sulfide		
	Color(s):	red		
	Hardness:	2 - 2.5	SpecGrav:	8 - 8.2
	Fracture:	splintery	Cleavage:	perfect
	Crystal:	hexagonal (rhombohedral - thick plates common)		
	Environment:	near hot springs and volcanic activity		
	Association:	pyrite, marchasite, stibnite, realgar, galena, hematite		
	Locals:	Almaden/Spain California, Nevada, Oregon, Texas/USA China		
	Misc:	name originally from ancient Persian "zinjifrah", "dragons blood", soluble in aqua-regia. Used as a carving material in China.		






Name:	cubanite			
	Class:	Sulfides		
	Chemistry:	CuFe2S3		
	Color(s):	bronze=yellow metallic		
	Hardness:	3.5-4	SpecGrav:	4.1
	Fracture:	conchoidal	Cleavage:	none
	Crystal:	orthorhombic; prismatic with longitudinal striations		
	Environment:	in lamellar growths with chalcopryite in high-temperature coper deposits		
	Association:	chalcopryite, pyrrhotite, siderite		
	Locals:	/Germany / Quebec, Canada /		
	Misc:	Named after its locality, Barracanao, Cuba		






Name:	cylindrite			
	Class:	Sulfides		
	Chemistry:	Pb3Sn4Sb2S12 mixed lead-tin-antimony sulfide		
	Color(s):	gray, blackish-gray, metallic luster		
	Hardness:	2.5	SpecGrav:	5.4
	Fracture:	conchoidal	Cleavage:	none
	Crystal:	Uncertain (crystals often in the form of small tubes)		
	Environment:	In tin deposits and ores		
	Association:	cassiterite, franckeite, teallite		
	Locals:	Bolivia Ukraine		
	Misc:	From the Greek word, kylindros, "cylinder."		





Name:	enargite			
Class:	Sulfides			
Chemistry:	Cu ₃ AsS ₄ Copper Arsenic Sulfide			
Color(s):	steel gray, dark green, to iron black, metallic			
Hardness:	3 - 3.5	SpecGrav:	4.4 - 4.5	
Fracture:	uneven	Cleavage:	complete	
Crystal:	Orthorhombic (often prismatic, usually vertically striped) sometimes tabular and often twinned			
Environment:	forms in hydrothermal replacement deposits			
Association:	pyrite, chalcopryite, galena, bornite, chalcosite,			
Locals:	Montana, Utah, USA Chile Philippines Germany Hungary Peru Namibia			
Misc:	The name comes from the Greek "enargos", meaning "distinct" from its nearly perfect prismatic cleavage. Soluble in nitric acid and aqua regia.			






Name:	galena			
	Class:	Sulfides		
	Chemistry:	PbS Lead Sulfide		
	Color(s):	metallic-submetallic gray		
	Hardness:	2.5 - 3.0	SpecGrav:	7.2 - 7.6
	Fracture:	conchoidal	Cleavage:	perfect
	Crystal:	cubic (cubes, octahedrons, often twinned)		
	Envronment:	pegmatites, high temperature to low temperature hydrothermal veins, replacements in chalks		
	Association:	sphalerite, chalcopyrite, pyrite, barite, fluorite,calcite		
	Locals:	Germany Austria Zambia Canada Idaho, Colorado, Mo., USA		
	Misc:	soluble in HCl when heated (toxic gas produced), Dissolves in Nitric Acid producing small flakes of Sulfur, and a fine white precipitate (lead sulfate). Dark gray streak.		






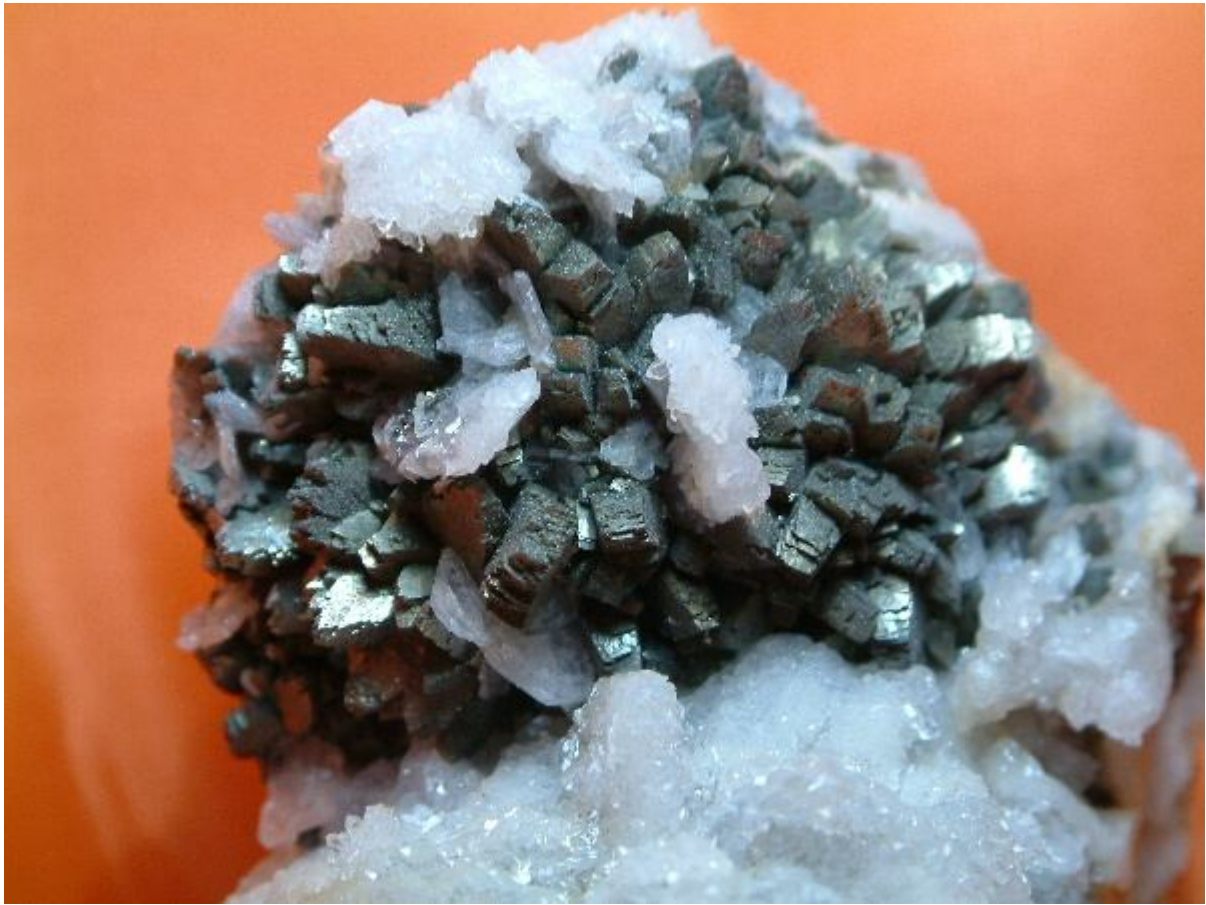
Name:	kermesite			
	Class:	Sulfides		
	Chemistry:	Sb2S2O		
	Color(s):	red, reddish-brown, yellowish powder		
	Hardness:	1-1.5	SpecGrav:	4.7
	Fracture:	conchoidal - brittle	Cleavage:	complete
	Crystal:	monoclinic; acicular, radiating		
	Environment:	oxidation zone of antimony deposits, the alteration product of stibnite.		
	Association:	stibnite, valentinite, senarmontite		
	Locals:	Germany / Czechoslovakia / Italy / Canada / CA., ID. USA / Mexico		
	Misc:	from the Persian, qurmizq, meaning "crimson"		






Name:	marcasite			
	Class:	Sulfides		
	Chemistry:	FeS2 Iron Sulfide		
	Color(s):	pale-yellow to brown metallic, Streak:grayish or brownish black		
	Hardness:	6 - 6.5	SpecGrav:	4.5 - 5.0
	Fracture:	uneven	Cleavage:	distinct 2 directions
	Crystal:	Orthorhombic (twinning common - coxcomb pattern not unusual)		
	Envronment:	hydrothermal deposits, tends to form at lower temperature and in acid solutions whereas pyrite forms at higher temperature and from more basic solutions.		
	Association:	pyrite, quartz, galena, magnetite, feldspars		
	Locals:	Mexico Germany France Missouri/USA		
	Misc:	name comes from Arabic word used for pyrite "markaschatsa", "fire stone". It may disintegrate with time in collections as it air oxidizes.		





Name:	millerite		
Class:	Sulfides		
Chemistry:	NiS Nickel Sulfide		
Color(s):	gray, yellowish, brassy, metallic		
Hardness:	3 - 3.5	SpecGrav:	5.3 - 5.5
Fracture:	splintery	Cleavage:	perfect
Crystal:	hexagonal (usually slender, hair-like, acicular crystals, often radiating groups)		
Environment:	hydrothermal replacement deposits, volcanic exhalation product.		
Association:	calcite, chalcopyrite, sphalerite, galena, linneite, gerdorffite		
Locals:	Michigan, New York, Pennsylvania, USA Canada Germany		
Misc:	Named for the English mineralogist, W. H. Miller. Soluble in HNO ₃ and aqua-regia.		




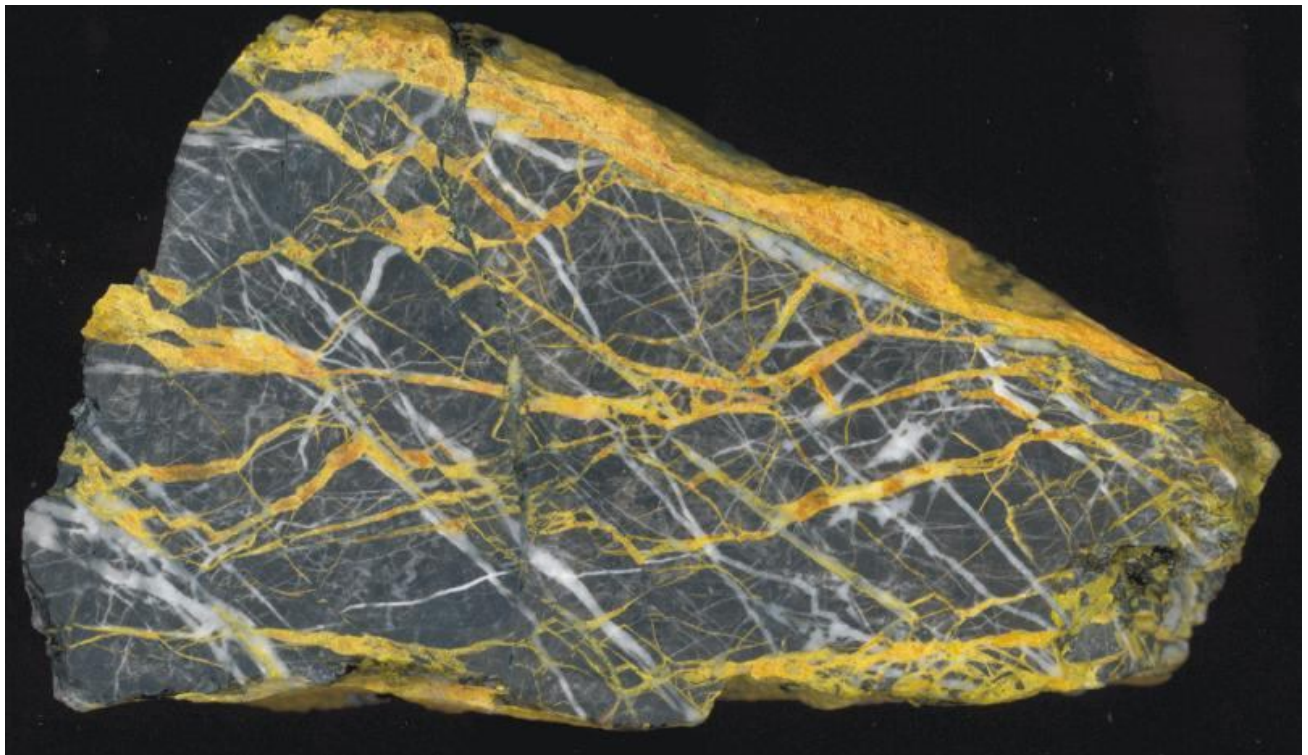


Name:	molybdenite			
Class:	Sulfides			
Chemistry:	MoS2 Molybdenum Sulfide			
Color(s):	lead-gray, metallic			
Hardness:	1 - 1.5	SpecGrav:	4.6 - 5.1	
Fracture:	none	Cleavage:	perfect	
Crystal:	hexagonal (flat tabular plates common, scales, foliated masses)			
Envronment:	in quartz veins and pegmatites, hypothermal veins, and hydrothermal veins, and some metamorphic rocks.			
Association:	quartz, wolframite, cassiterite, sphalerite, pyrite, magnetite			
Locals:	Colorado, New Jersey, USA Canada England Sweden USSR Austrailia			
Misc:	The name comes from the Greek "molybdos", meaning "lead". Soluble in HNO3 and aqua-regia. It feels greasy to the touch and has been used as a powdered lubricant.			





Name:	orpiment			
Class:	Sulfides			
Chemistry:	As ₂ S ₃ Arsenic Sulfide			
Color(s):	lemon-yellow, orange, orange-brownish			
Hardness:	1.5 - 2.0	SpecGrav:	3.4 - 3.5	
Fracture:	bladed	Cleavage:	complete	
Crystal:	monoclinic (poorly formed and crystals are rare. Crystals are prismatic or tabular when present. Often granular or encrusting.)			
Environment:	a sublimation product in fumaroles, and a byproduct of the decay of realgar.			
Association:	realgar, stibnite, pyrite, sphalerite, calcite			
Locals:	USSR Germany Switzerland Utah, Nevada, USA Hungary Italy Turkey China			
Misc:	The name is derived from the Latin "auripigmentum", relating to the minerals "goldish color". Soluble in nitric acid.			




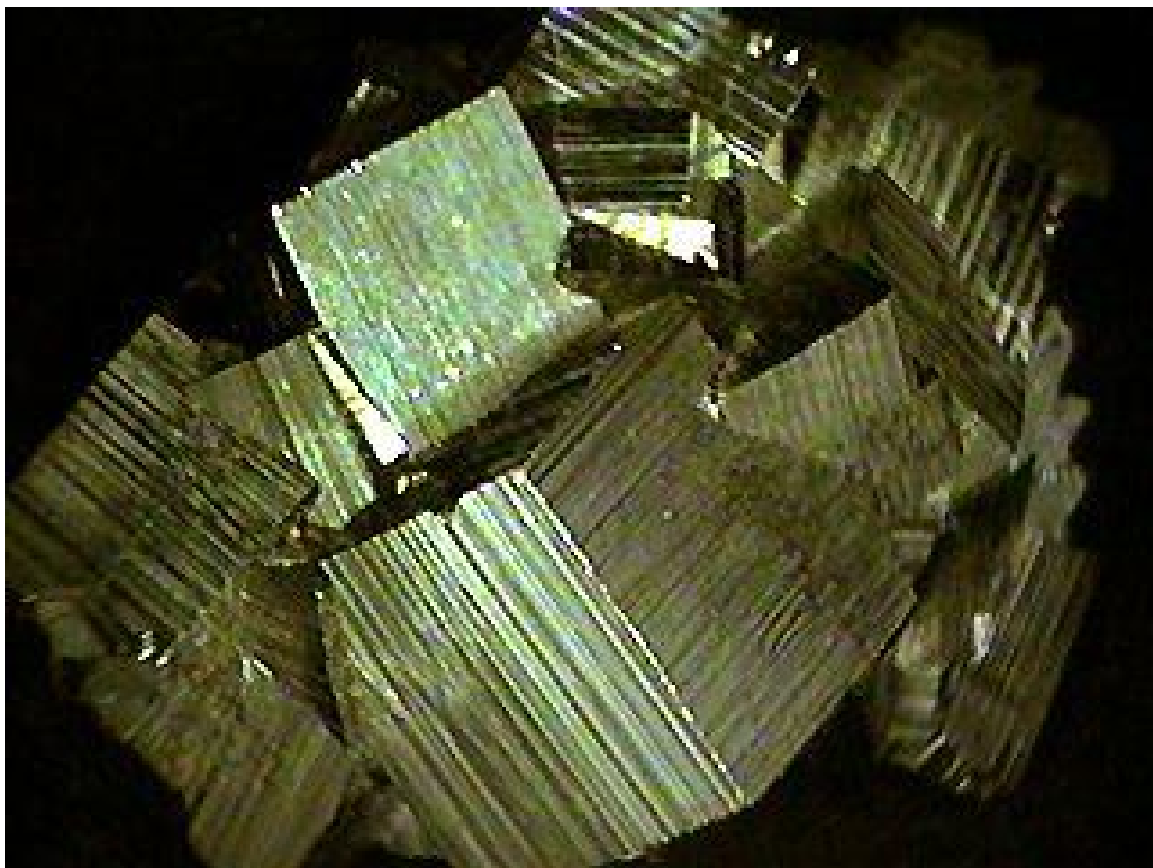


Name:	pyrargyrite		
Class:	Sulfides		
Chemistry:	Ag_3SbS_3		
Color(s):	gray, iron black, metallic		
Hardness:	2-2.5	SpecGrav:	6.2-6.5
Fracture:	uneven	Cleavage:	distinct 2 directions
Crystal:	Orthorhombic; usually short prismatic to tabular, sometimes striated		
Environment:	epithermal veins		
Association:	pyrite, quartz, galena		
Locals:	Mexico / CA., NV., ID., USA / Ontario, Canada		
Misc:	named from the Greek. pyr, "fire" and aregyros meaning "silver".		






Name:	pyrite			
Class:	Sulfides			
Chemistry:	FeS2			
Color(s):	pale-yellow metallic, Streak: greenish/brownish black			
Hardness:	6 - 6.5	SpecGrav:	4.9 - 5.2	
Fracture:	conchoidal	Cleavage:	none	
Crystal:	Isometric (cubes, many twins, xtls sometimes striated)			
Environment:	hydrothermal veins, pegmatites, hydrothermal replacements			
Association:	quartz, microcline, biotite, hematite, magnetite, rutile, calcite, sphalerite			
Locals:	Spain Portugal Italy Wyoming, New York/USA			
Misc:	soluble in nitric acid, known as "fools gold", the name "Pyrite" means "fireStone" in Greek. The name fire stone came from the common belief that pyrite held fire (inside) and was used by ancients as a sparking source.			






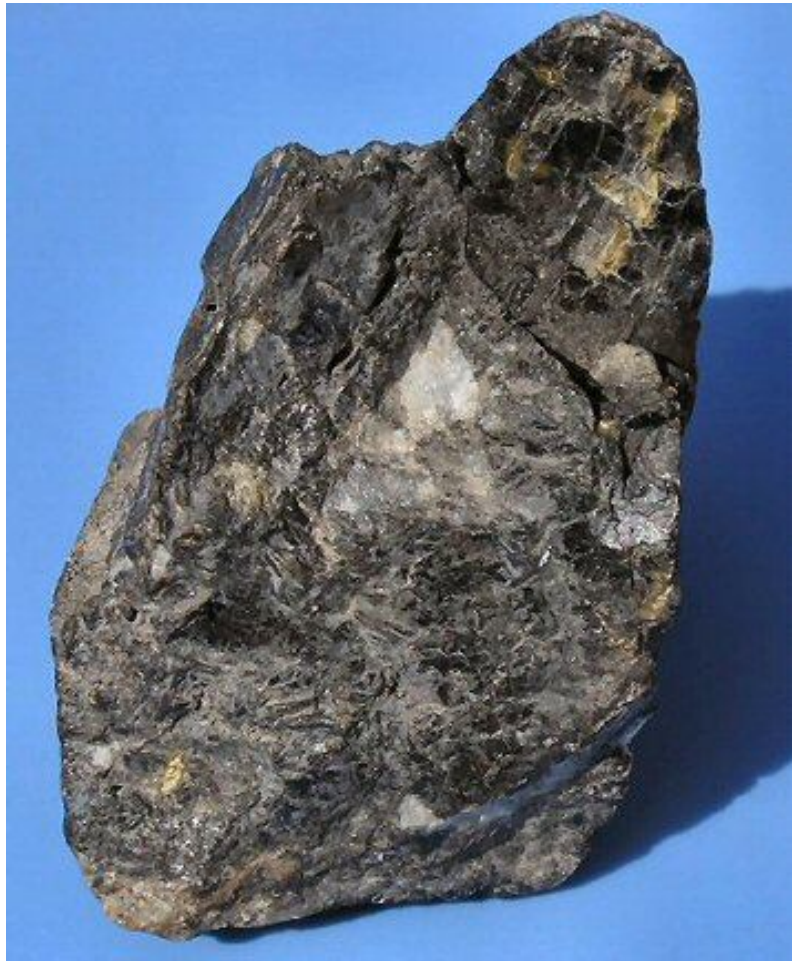
Name:	siegenite			
Class:	Sulfides			
Chemistry:	(Co, Ni) ₃ S ₄			
Color(s):	steel-gray, silvery sometimes with a brownish look, metallic			
Hardness:	4.5-5.5	SpecGrav:	4.5-4.8	
Fracture:	uneven	Cleavage:	imperfect	
Crystal:	Isometric; octahedrons, often botryoidal			
Environment:	hydrothermal deposits			
Association:	chalcopyrite, pyrite			
Locals:	MO., USA / Germany / Canada			
Misc:	locality name from, Siegen, Germany.			



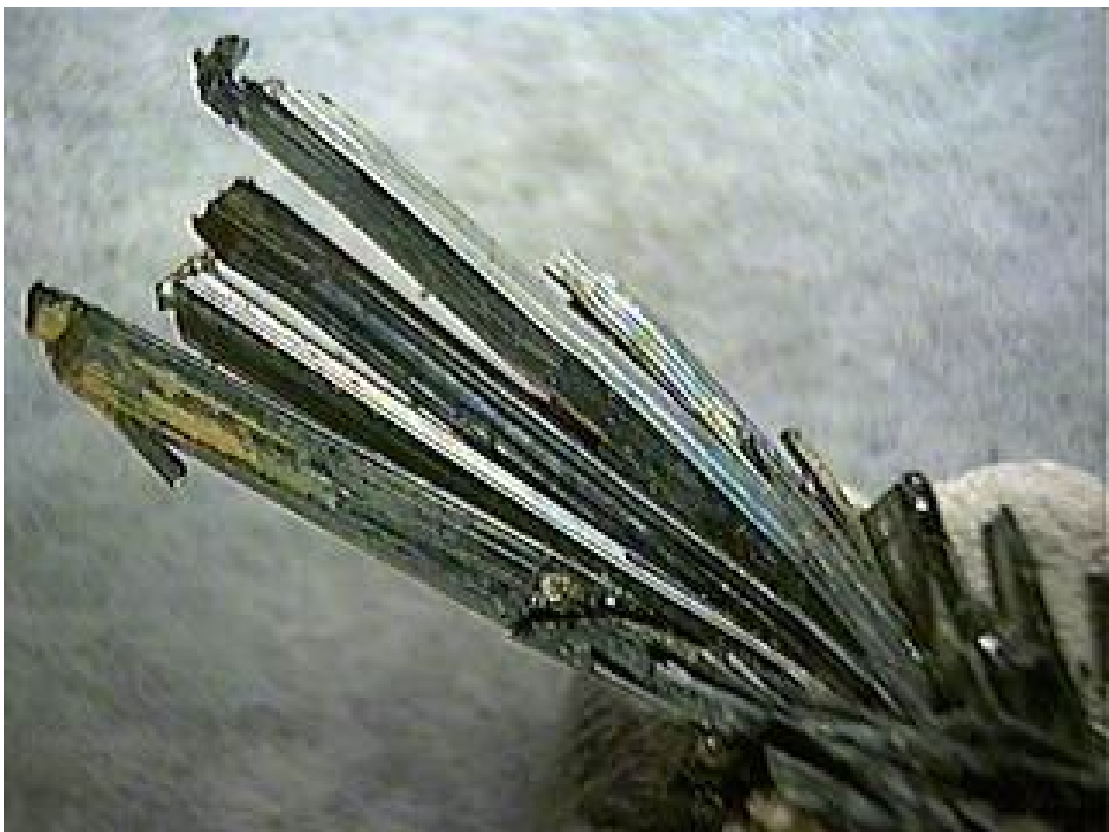


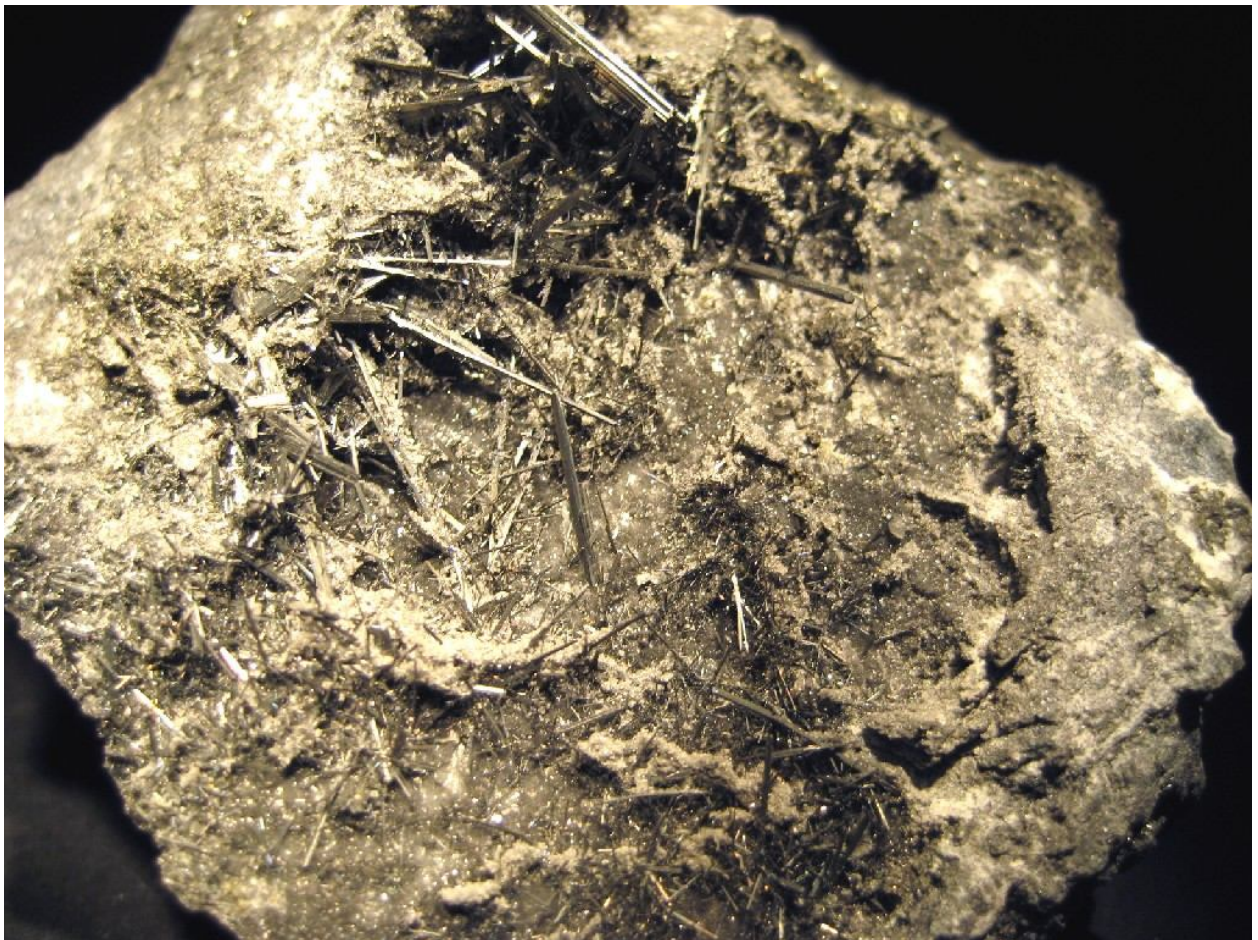
Name:	sphalerite (blende)			
Class:	Sulfides			
Chemistry:	ZnS Zinc Sulfide			
Color(s):	yellow, yellow-brown, brown to black, seldom red or green			
Hardness:	3.5 - 4.0	SpecGrav:	3.9 - 4.2	
Fracture:	conchoidal	Cleavage:	complete	
Crystal:	isometric (tetrahedral, dodecahedral) sometimes granular			
Environment:	mesothermal veins, limestones, hydrothermal deposits			
Association:	quartz, galena, pyrrhotite, pyrite, marchasite, barite, fluorite, chalcopyrite			
Locals:	Poland Idaho, New Jersey, Missouri, Ohio, USA Mexico Germany USSR			
Misc:	The name is from the Greek word "sphaleros", meaning "treacherous" - probably because of similarity to several other minerals. Soluble in HNO3. It is the principal ore of zinc.			






Name:	stibnite				
	Class:	Sulfides			
	Chemistry:	Sb2S3 Antimony Sulfide			
	Color(s):	gray-metallic, Streak:dark-lead gray			
	Hardness:	2	SpecGrav:	4.6 - 4.7	
	Fracture:	uneven	Cleavage:	perfect 1 direction	
	Crystal:	orthorhombic, slightly flexible crystals, often radiating blades			
	Envronment:	epithermal veins			
	Association:	gold, cinnabar, galena, barite, quartz			
	Locals:	Shikoku/Japan Rumania Idaho, Nevada. California / USA China			
Misc:	from the Greek name "stibi", used to describe antimony which was used to separate gold by the ancients				






Name:	tetrahedrite			
	Class:	Sulfides		
	Chemistry:	Cu12Sb4S13 Mixed Copper/Antimony Sulfide		
	Color(s):	steely gray to flat black, metallic, gray streak		
	Hardness:	3 - 4	SpecGrav:	4.6 - 5.1
	Fracture:	conchoidal	Cleavage:	none
	Crystal:	Isometric (predominantly in tetrahedron) often inter grown masses		
	Environment:	common copper minerals they form in mesothermal and epithermal veins, they also form with carbonatites, and in hydrothermal deposits.		
	Association:	galena, quartz, pyrite, chalcopyrite, bornite		
	Locals:	Germany Mexico British Columbia Idaho, Colorado, Utah, USA Peru		
	Misc:	The name is derived from its crystal habit, being predominantly tetrahedral . It is soluble in nitric acid and aqua regia		

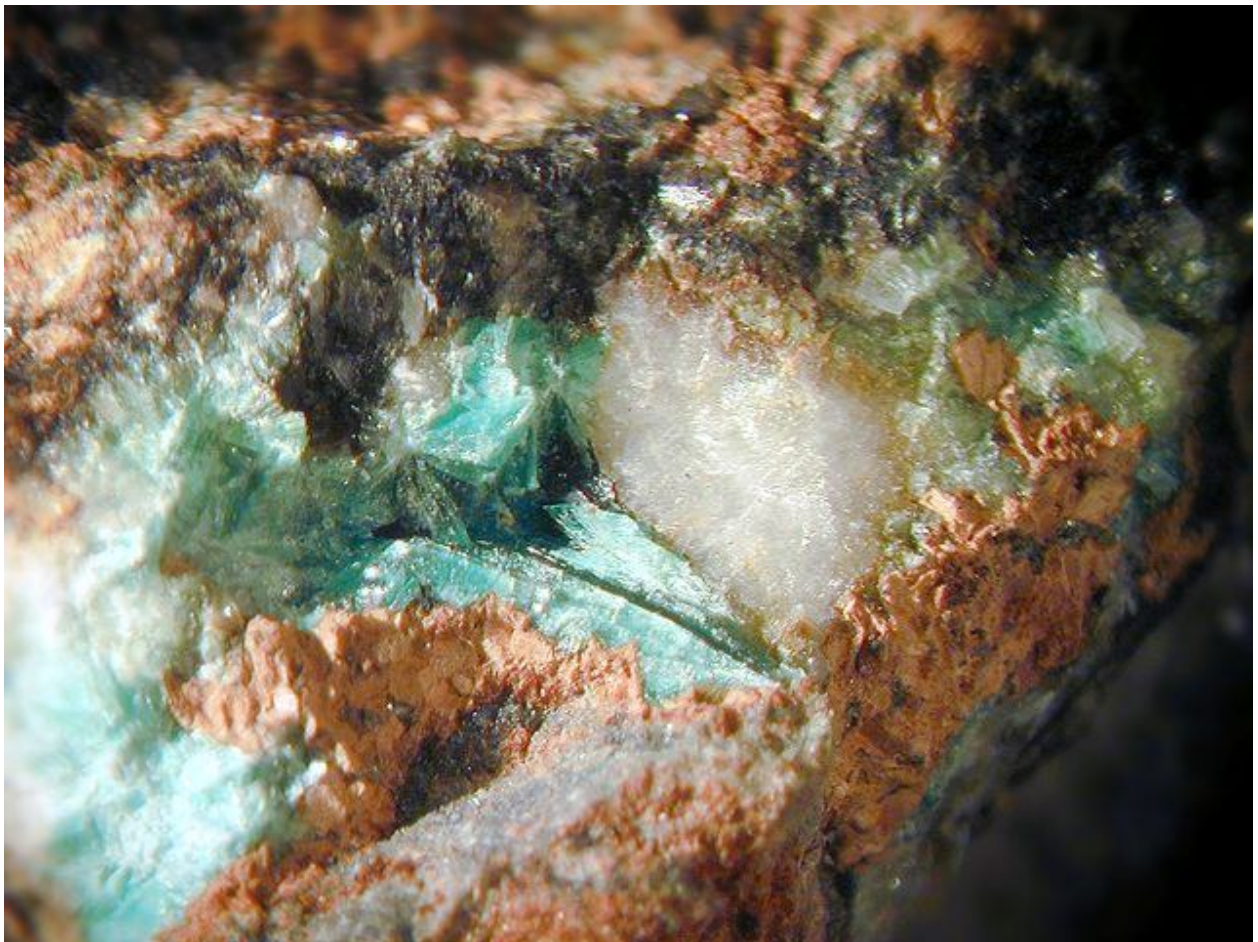





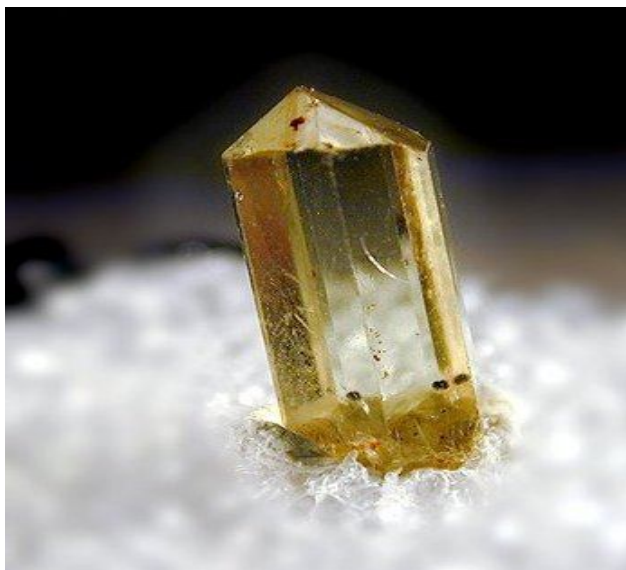
PHOSPHATES / VANADINATES / ARSENATES

Name:	annabergite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	(Ni, Co)3(AsO4)2 € 8H2O		
	Color(s):	Greenish		
	Hardness:	2	SpecGrav:	3-3.1
	Fracture:	lamellar	Cleavage:	perfect
	Crystal:	monoclinic, prismatic to tabular, often acicular ... sometimes massive.		
	Environment:	oxidation zones		
	Association:	other nickel ores		
	Locals:	Harz Mtns. Germany/ Sardinia, Italy/ Spain / Greece/ Canada/ USA		
	Misc:	very similar to Erythrite, but with ore Ni than Co.		






Name:	apatite			
Class:	Phosphates/Arsenates/Vanadates			
Chemistry:	Ca5(PO4)3(F,CL,OH)			
Color(s):	Green, yellow, brown, red, yellow, blue, pink, white			
Hardness:	5	SpecGrav:	3.1-3.2	
Fracture:	uneven, conchoidal	Cleavage:	poor, unidirectinal	
Crystal:	hexagonal, usually short prismatic, sometimes tabular, often massive without form.			
Envronment:	Igneous rocks, and some metamorphics. In plutonic, granite pegmatites and hornfels.			
Association:	acmite, titanite, magnetite, albite, andradite, nepheline			
Locals:	Ontario, Canada/ San Diego, California/ Durango, Mexico			
Misc:	the name comes fro m the Greek, apate. which means "deceit". Because it is often confused with other gem minerals like beryl, olivine (peridot), and fluorite.			





Name:	autunite		
Class:	Phosphates/Arsenates/Vanadates		
Chemistry:	$\text{Ca}(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 10-12 \text{H}_2\text{O}$		
Color(s):	lemon-sulfur yellow, yellow-green, green		
Hardness:	2-2.5	SpecGrav:	3.1-3.2
Fracture:		Cleavage:	perfect, one direction
Crystal:	tetragonal; usually tabular xtls. often micaceous		
Environment:	secondary uranium mineral, pegmatites and hypothermal veins.		
Association:	torbernite, uranocircite, fluorite, barite, quartz		
Locals:	Germany / England / France / Zaire, Africa / Grafton, Colorado, NH, NC, SD, USA /		
Misc:	The name is derived from a locally ... Autun, Saone-et-Loire, France.		




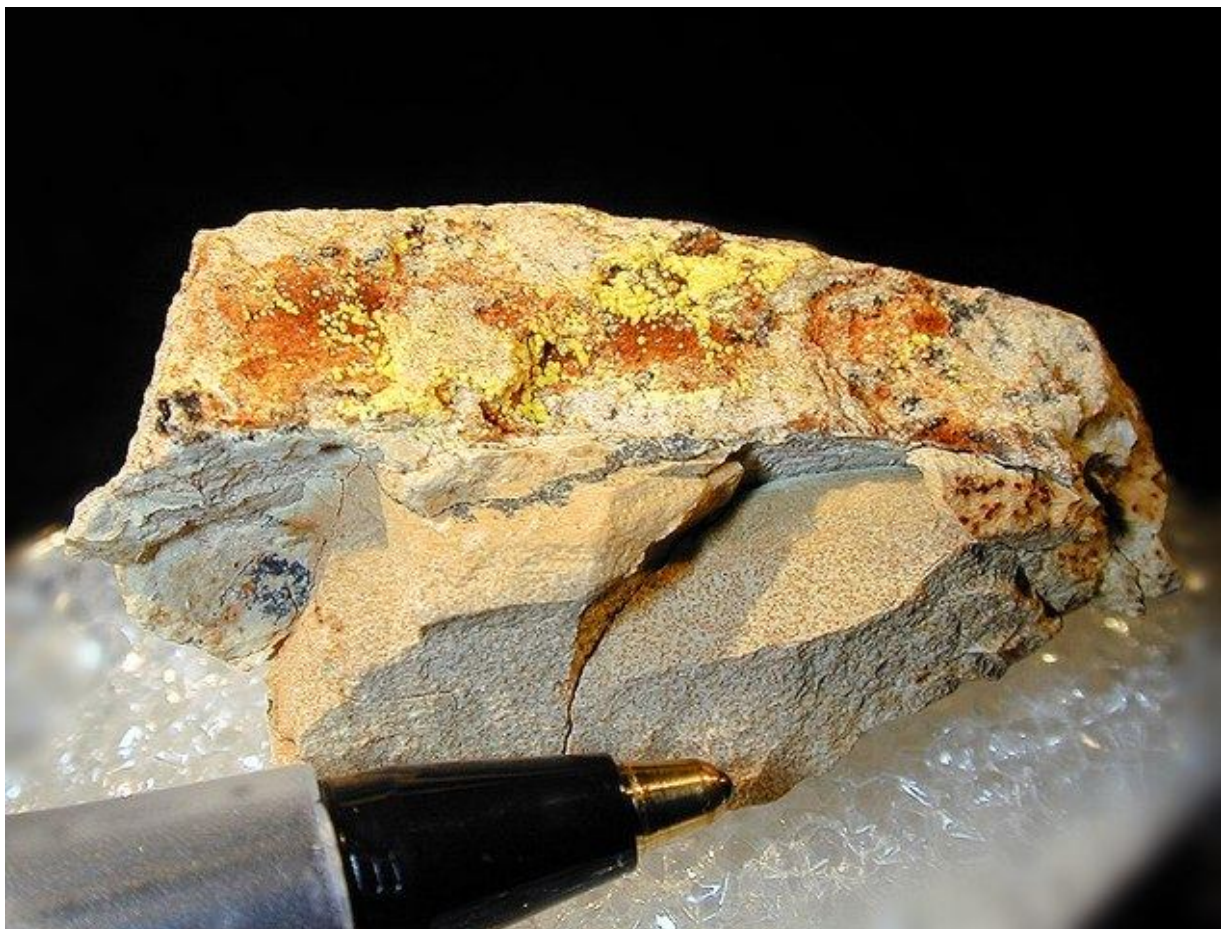


Name:	brazilianite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	NaAl3(PO4)2(OH)4 Hydrous Sodium Aluminum Phosphate		
	Color(s):	Colorless, yellow to yellow green Streak: colorless		
	Hardness:	5.5	SpecGrav:	2.98
	Fracture:	Conchoidal	Cleavage:	1 good
	Crystal:	Monoclinic - crystals are often prismatic and often nearly equal in all directions, globular.		
	Environment:			
	Association:	apatite, quartz, wardite, tourmaline		
	Locals:	Brazil N.H., USA		
	Misc:	Name derived from it most famous locality Brazil.		






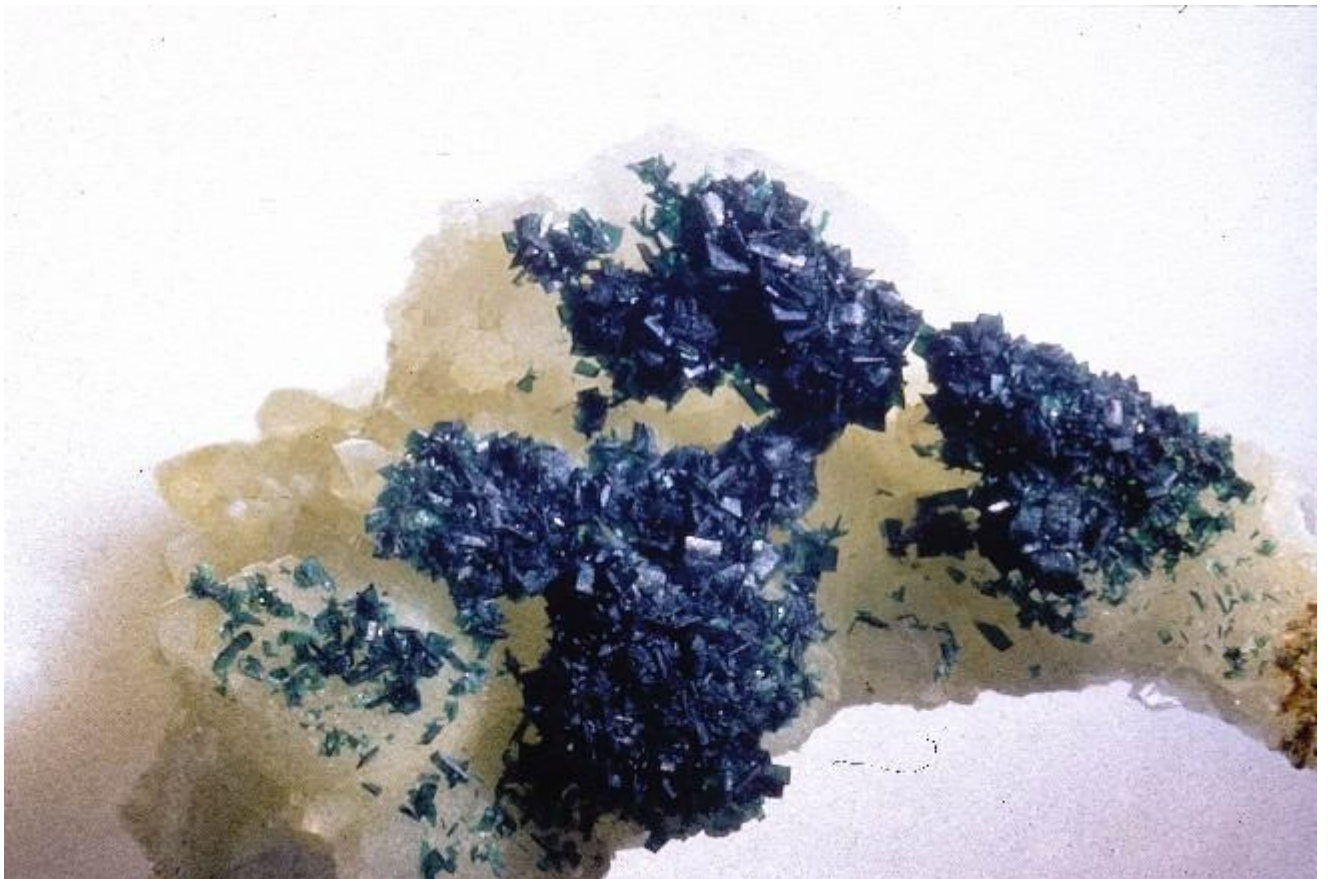
Name:	carnotite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	$K_2(UO_2)_2V_2O_8 \cdot 3H_2O$		
	Color(s):	yellow, yellow-brown, greenish-yellow streak: light yellow		
	Hardness:	2.0	SpecGrav:	2.7 - 4.6
	Fracture:	uneven	Cleavage:	perfect
	Crystal:	Monoclinic - prismatic, often as a fine dispersion over a host rock. Crust like aggregates over a matrix.		
	Envronment:	a secondary uranium ore that occurs mainly in sandstone deposits.		
	Association:			
	Locals:	Co., N.M., Ut., Az., USA		
Misc:	Named after a French chemist;M. A. Carnot			






Name:	clinoclase			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	Cu3AsO4 (OH)3 hydros copper arsenate		
	Color(s):	dark green, blue, dark blue to black		
	Hardness:	2.5 - 3.0	SpecGrav:	4.33
	Fracture:	uneven	Cleavage:	perfect
	Crystal:	monoclinic (often in groups - radiating as rosettes, tabular and elongated)		
	Environment:	Secondary mineral in the oxidation zone of copper sulfide deposits.		
	Association:	olivinite, cornubite		
	Locals:	Morocco Australia Japan England Chile Nevada, Utah, USA		
	Misc:	Soluble in dilute acids and produces a garlic smell.		




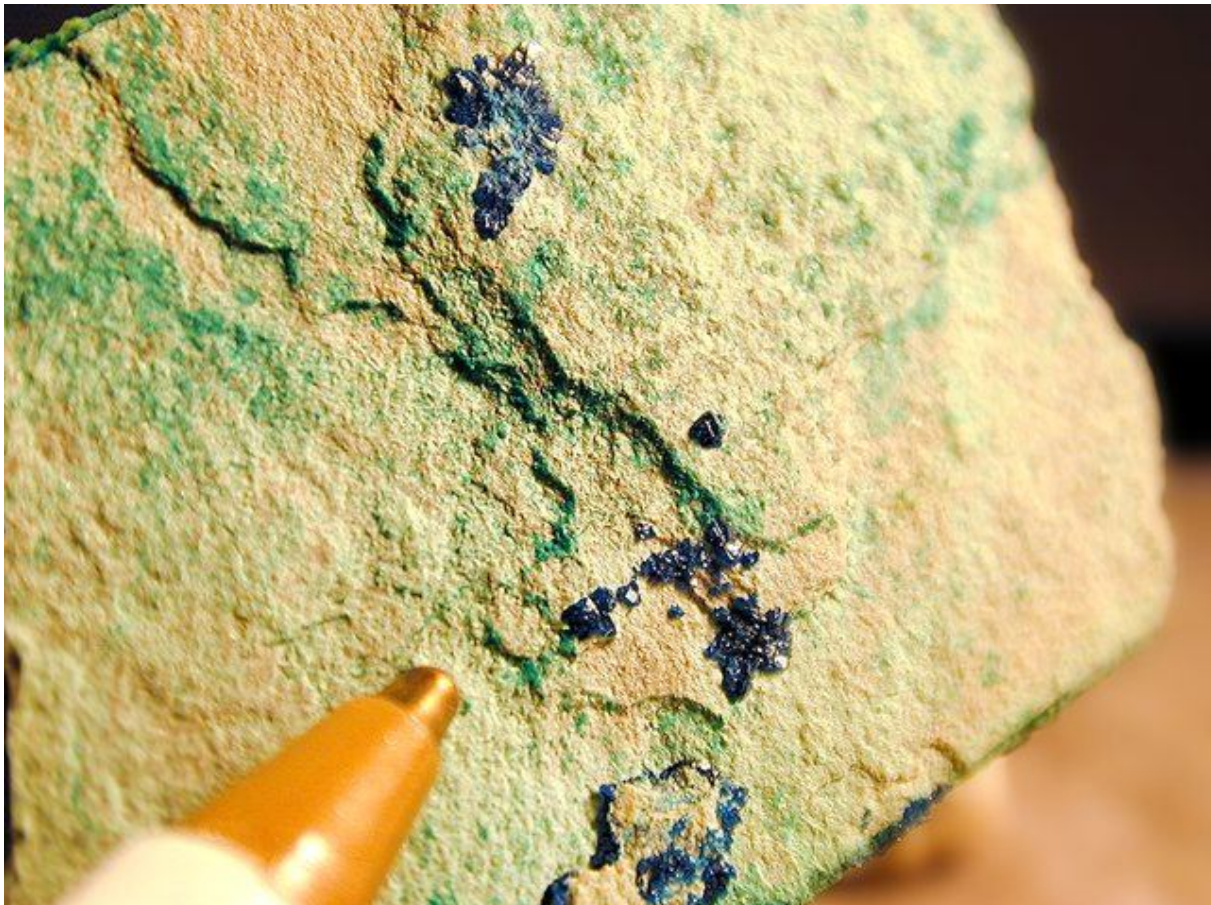


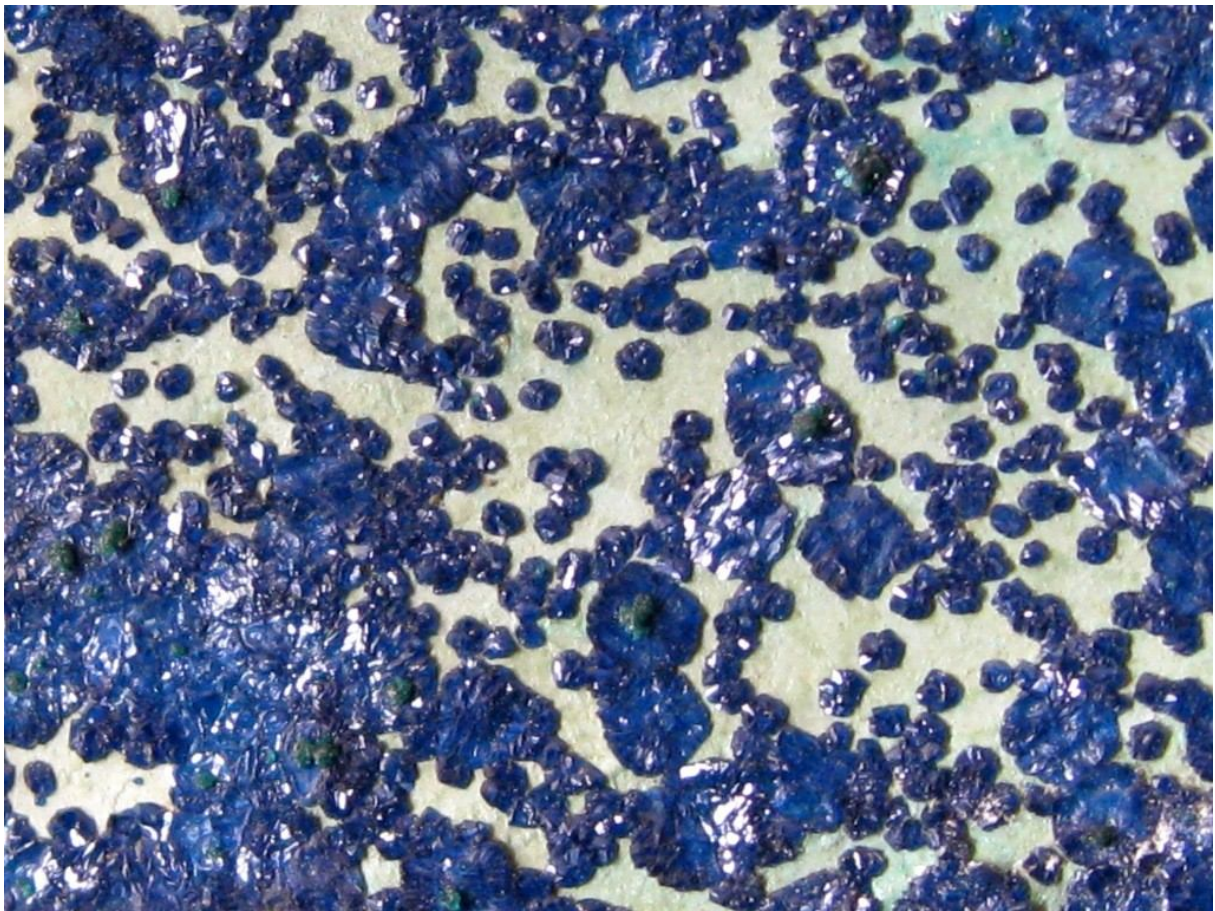
Name:	collinsite			
Class:	Phosphates/Arsenates/Vanadates			
Chemistry:	$\text{Ca}_2(\text{Mg,Fe})(\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$ Hydrous Calcium Magnesium Iron Phosphate			
Color(s):	Colorless, white, light brown			
Hardness:	3.5	SpecGrav:	2.93	
Fracture:	brittle	Cleavage:	2 perfect	
Crystal:	Triclinic - often prismatic to tabular, sometimes a radial structure			
Environment:				
Association:				
Locals:	Canada USSR Austria Australia N.C., S.D., USA			
Misc:	Named after William H. Collins.			






Name:	cornetite			
Class:	Phosphates/Arsenates/Vanadates			
Chemistry:	Cu3(PO4)(OH)3			
Color(s):	greenish-blue to dark blue			
Hardness:	4.5	SpecGrav:	4.1	
Fracture:	uneven	Cleavage:	none	
Crystal:	Orthorhombic; short prismatic often somewhat rounded, sometimes radiating fibers			
Environment:	oxidation zones			
Association:	malachite, pseudo malachite, brochanite			
Locals:	Zaire			
Misc:				






Name:	cornubite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	Cu5(AsO4)2(OH)4 hydros copper arsenate		
	Color(s):	light green, apple-green, to dark green		
	Hardness:	unknown	SpecGrav:	4.6
	Fracture:	unknown	Cleavage:	unknown
	Crystal:	triclinic (often fibrous masses or botryoidal aggregates)		
	Envronment:	only known in a few localities		
	Association:	clinoclase, malachite, olivinite, cornwallite, lironite		
	Locals:	Cornwall, Devon, Cumberland, England Arizona, Utah, USA Japan		
	Misc:	Named from Cornubia, the medieval latin name for Cornwall.		






Name:	eosphorite				
	Class:	Phosphates/Arsenates/Vanadates			
	Chemistry:	(Mn,Fe)AlPO4(OH)2*H2O Mangano Iron Alumino-Phospahte			
	Color(s):	Pink, yellow, colorless, red, brown or black			
	Hardness:	5	SpecGrav:	3.0	
	Fracture:	uneven	Cleavage:	poor	
	Crystal:	Monoclinic (prismatic crystals or radial bunches)			
	Envrionment:	found in granite pegmatites, with other manganese phosphates			
	Association:	childrenite, lipscombite, phosphoferrite, purpurite,			
	Locals:	New Hampshire, Main, Connecticut, USA Brazil Bavaria Rwanda Namibia			
Misc:	Named from the Greek for "dawn-bearing," in allusion to the pink color.				





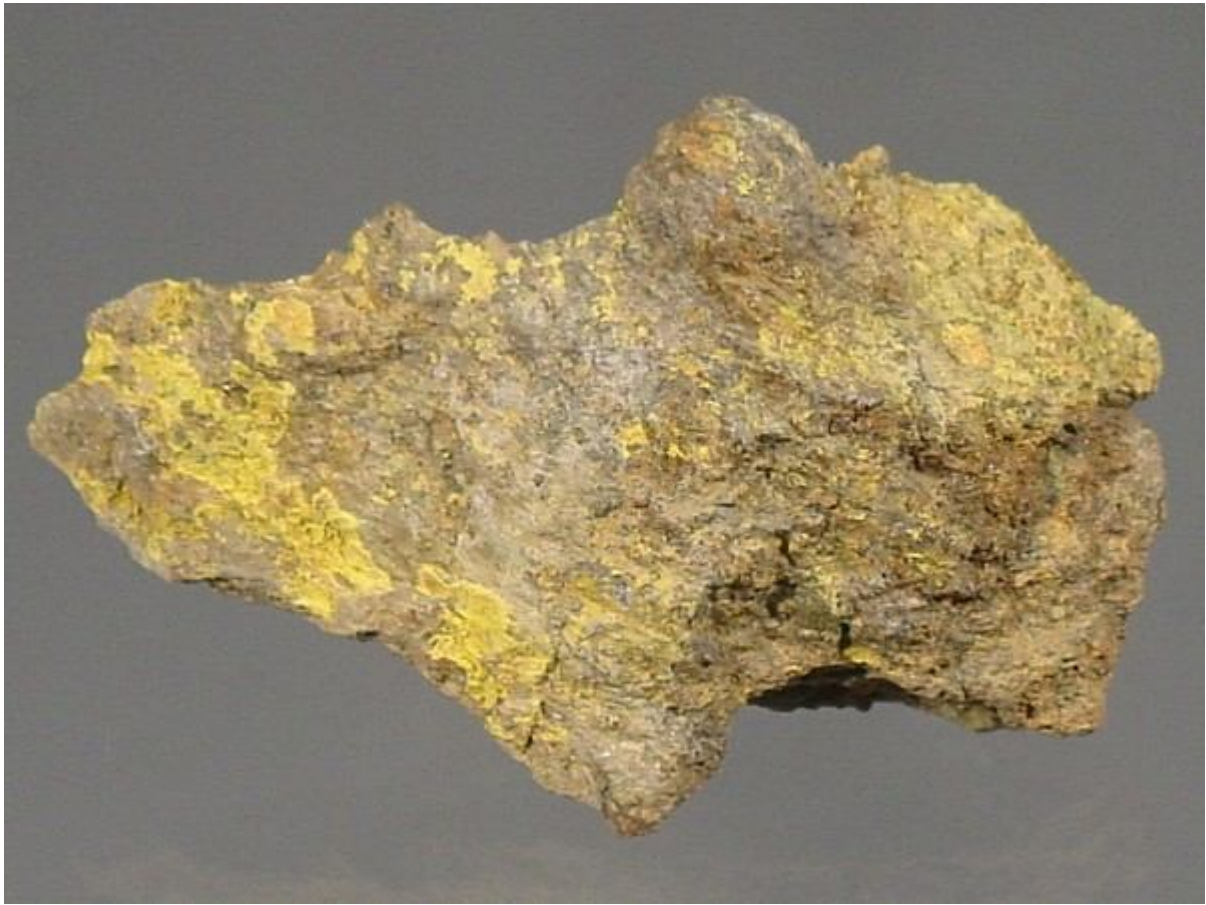
Name:	erythrite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	Co3(AsO4)2 * 8H2O Hydrous Cobalt Arsenate		
	Color(s):	peach blossom red, red-violet, magenta		
	Hardness:	1.5-2.5	SpecGrav:	3.07-3.18
	Fracture:	uneven	Cleavage:	perfect
	Crystal:	Monoclinic (prismatic, tabular, acicular) sometimes massive		
	Envronment:	found in oxidized zone of cobalt rich deposits, formed through alteration of cobaltite, and skutterudite.		
	Association:	cobaltite, annabergite, malachite, azurite		
	Locals:	Idaho, USA USSR Morocco Germany India South England Canada		
	Misc:	From the Greek word "erythos", meaning "red". It is soluble in hot nitric acid.		






Name:	francevillite		
	Class:	Phosphates/Arsenates/Vanadates	
	Chemistry:	(Ba,Pb)(UO2)2V2O8·5(H2O)	
	Color(s):	yellow, yellow-green, brown, yellow-orange	
	Hardness:	3	SpecGrav: 4.52
	Fracture:		Cleavage: perfect one direction
	Crystal:	orthorhombic; often small hair like crystal structures	
	Environment:		
	Association:		
	Locals:	Franceville, Gabon, Africa / PA, USA / Germany England	
	Misc:	Named for the locality in Franceville, Gabon.	






Name:	koettigite (kottigite)			
Class:	Phosphates/Arsenates/Vanadates			
Chemistry:	$\text{Zn}_3(\text{AsO}_4)_2 \cdot 8 \text{H}_2\text{O}$			
Color(s):	white, gray, brown-reddish			
Hardness:	2.5-3	SpecGrav:	3.3	
Fracture:	uneven	Cleavage:	perfect	
Crystal:	monoclinic, prismatic, long tabular, radiating fibers			
Environment:	oxidation zones of zinc deposits			
Association:	adamite			
Locals:	Mexico Germany Greece Namibia			
Misc:				






Name:	lazulite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	MgAl2(PO4)2(OH)2 Hydroxy Magnesium/Aluminum Phosphate		
	Color(s):	light blue, blue, dark blue, sometimes violet tints		
	Hardness:	5.0 - 6.0	SpecGrav:	3.0 - 3.1
	Fracture:	uneven	Cleavage:	indistinct
	Crystal:	Monoclinic, pseudo-dipyramidal		
	Environment:	In hypersilicic rocks, igneous veins, metamorphic quartzites.		
	Association:	rutile, quartz, kyanite, corundum, garnet, sapphire		
	Locals:	Austria Switzerland Brazil Georgia, USA		
	Misc:	Dissolves in strong hot acids very slowly, breaks apart when heated. The name is derived from the Persian "lazzward", meaning "blue". Scorzalite is the iron rich end-member where Fe substitutes for Mg.		






Name:	legrandite				
	Class:	Phosphates/Arsenates/Vanadates			
	Chemistry:	$\text{Zn}_2 (\text{AsO}_4) (\text{OH}) \cdot \text{H}_2\text{O}$			
	Color(s):	yellow, yellow-orange streak: white			
	Hardness:	4.0 - 5.0	SpecGrav:		4.0
	Fracture:	conchoidal	Cleavage:		imperfect
	Crystal:	Monoclinic - usually prismatic, usually well formewd and often large			
	Envronment:	secondary mineral in zinc ore bodies			
	Association:	sphalerite, pyrite, siderite, adamite, arsenopyrite			
	Locals:	Germany Greece Mexico Namibia			
	Misc:	Named after a mining engineer, Legrande (Belgian).			






Name:	libethenite		
Class:	Phosphates/Arsenates/Vanadates		
Chemistry:	$\text{Cu}_2(\text{PO}_4)(\text{OH})$ Copper hydroxy phosphate		
Color(s):	green, olive green, greenish black, Streak: olive green		
Hardness:	4.0	SpecGrav:	3.8 - 3.97
Fracture:	conchoidal	Cleavage:	good 2 directions
Crystal:	Orthorhombic (usually short prismatic)		
Environment:	oxidized zones of copper deposits,		
Association:	malachite, pseudo malachite, euchroite, limonite		
Locals:	France England USSR Zaire Nevada, New Mexico, Pennsylvania/USA Chile		
Misc:	Named after its locality, Lubietova (German Livethen), Czechoslovakia		






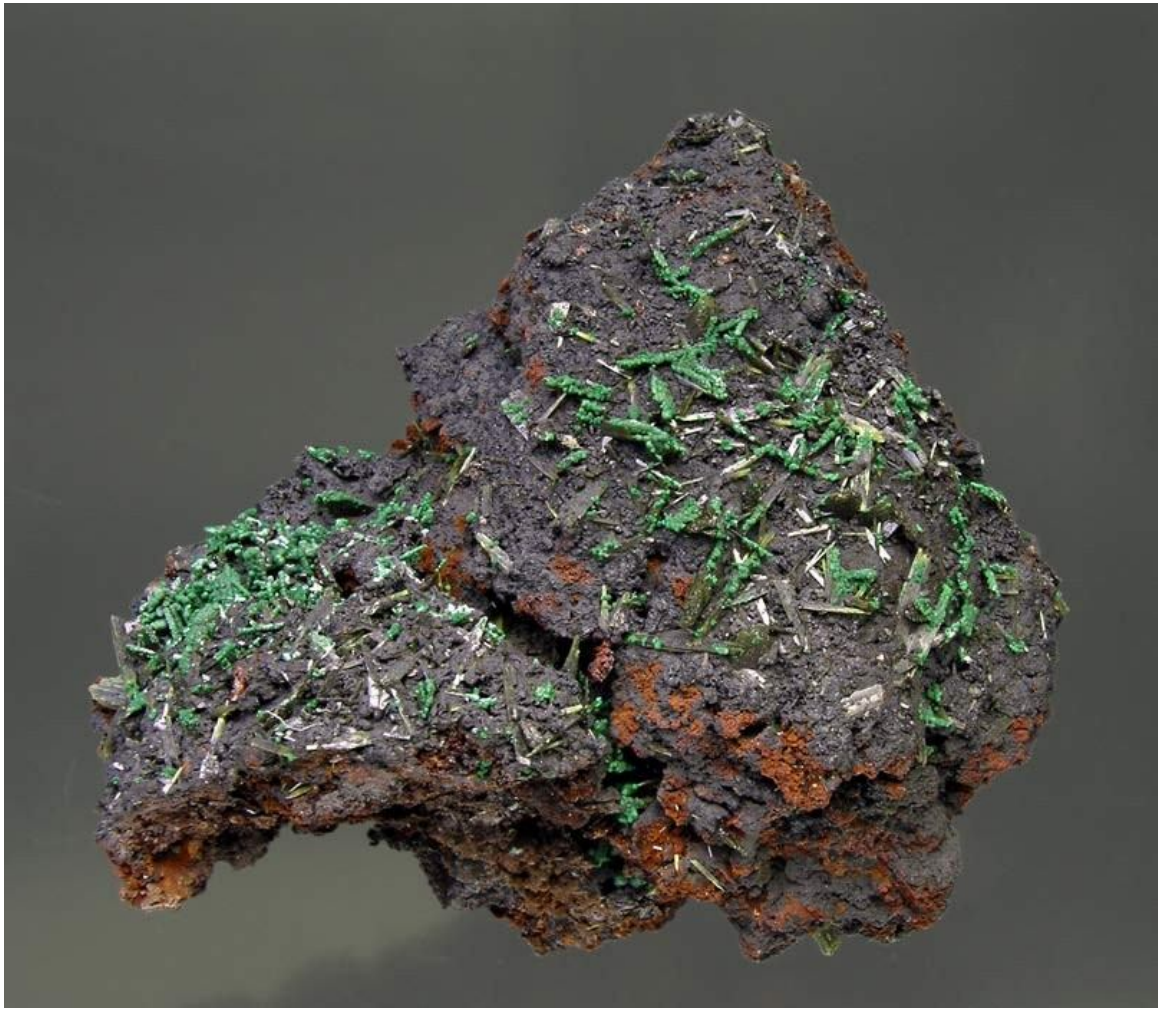
Name:	mimetite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	Pb5(AsO4)3Cl Lead ChloroArsenate		
	Color(s):	yellow, yellow-green, white, brown, Streak: white		
	Hardness:	3.5 - 4.0	SpecGrav:	7.0 - 7.3
	Fracture:	uneven	Cleavage:	incomplete
	Crystal:	monoclinic (often pseudo hexagonal)		
	Envronment:	formed in the alteration zone in hydrothermal replacement deposits		
	Association:	galena, pyromorphyte, wulfenite, limonite		
	Locals:	England Germany Arizona, Nevada/USA Mexico		
	Misc:	soluble in nitric acid, named from the Greek word "mimetes" which means "imitator" because of it's similarity to pyromorphyte		




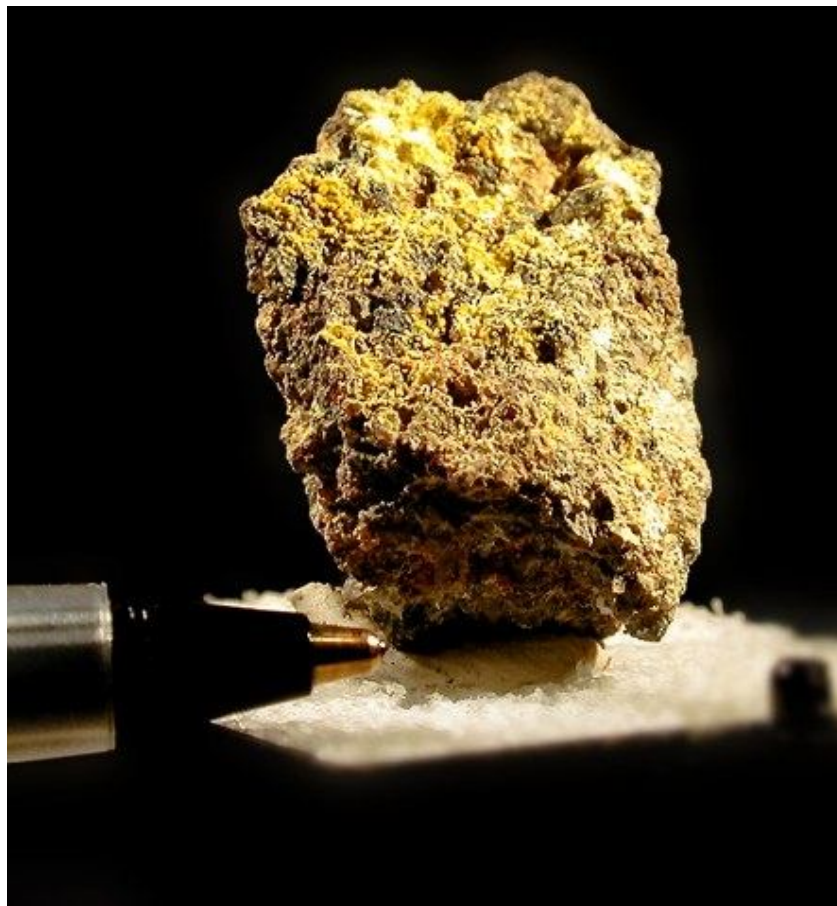


Name:	olivenite			
Class:	Phosphates/Arsenates/Vanadates			
Chemistry:	$\text{Cu}_2\text{AsO}_4(\text{OH})$ Hydrous Copper Arsenate			
Color(s):	green, greenish-black, olive-green to brown			
Hardness:	3	SpecGrav:	4.3 - 4.5	
Fracture:	conchoidal	Cleavage:	incomplete	
Crystal:	orthorhombic (elongated or short prismatic, sometimes acicular)			
Environment:	secondary mineral in the alteration of hydrothermal replacement deposits			
Association:	malachite, azurite, arsenopyrite, zeunerite			
Locals:	USSR Utah, Nevada, USA Greece Chile England			
Misc:	The name comes from the German word "olivenerz", meaning "olive ore". Soluble in both acids and ammonia.			




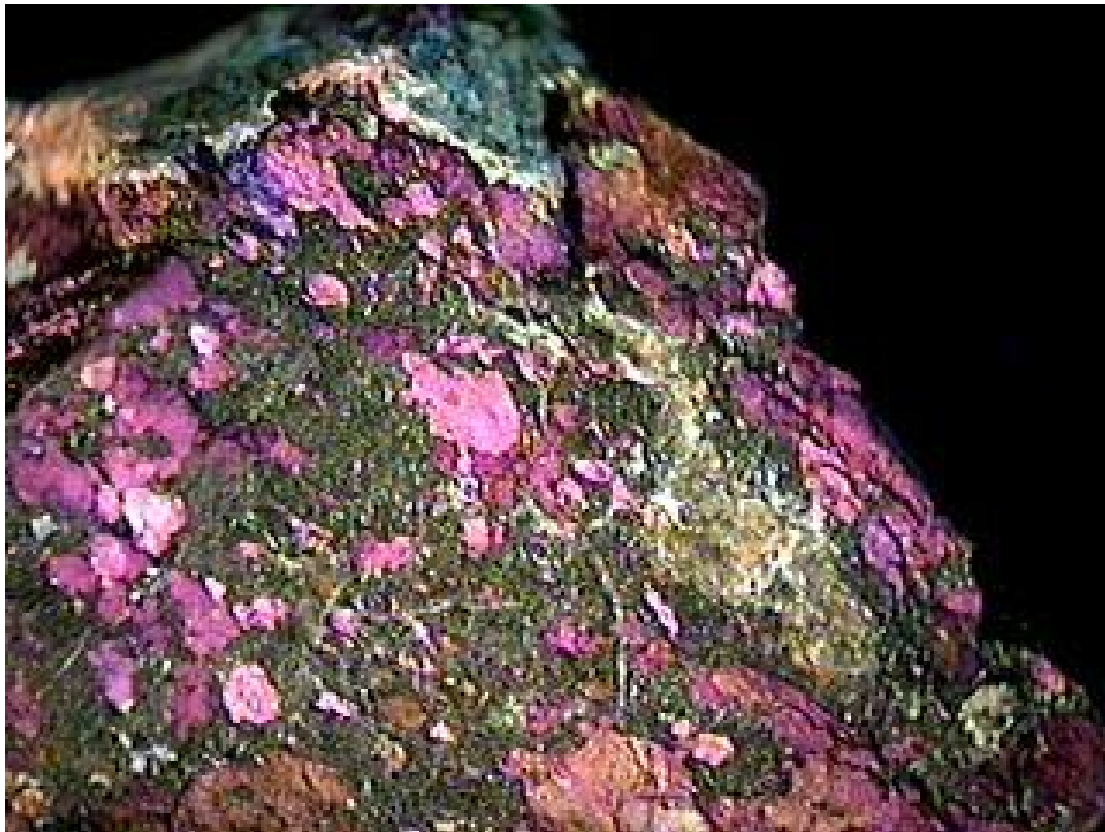


Name:	phurcalite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	Ca2(UO2)3O2(PO4)2·7(H2O)		
	Color(s):	yellow Streak yellow-white		
	Hardness:	3.0	SpecGrav:	4.22
	Fracture:		Cleavage:	perfect
	Crystal:	Orthorhombic - Dipyramidal - often radiating needle groups.		
	Environment:			
	Association:	brochantite		
	Locals:	Germany Portugal Sao Paulo in Brazil. Utah, USA		
	Misc:			






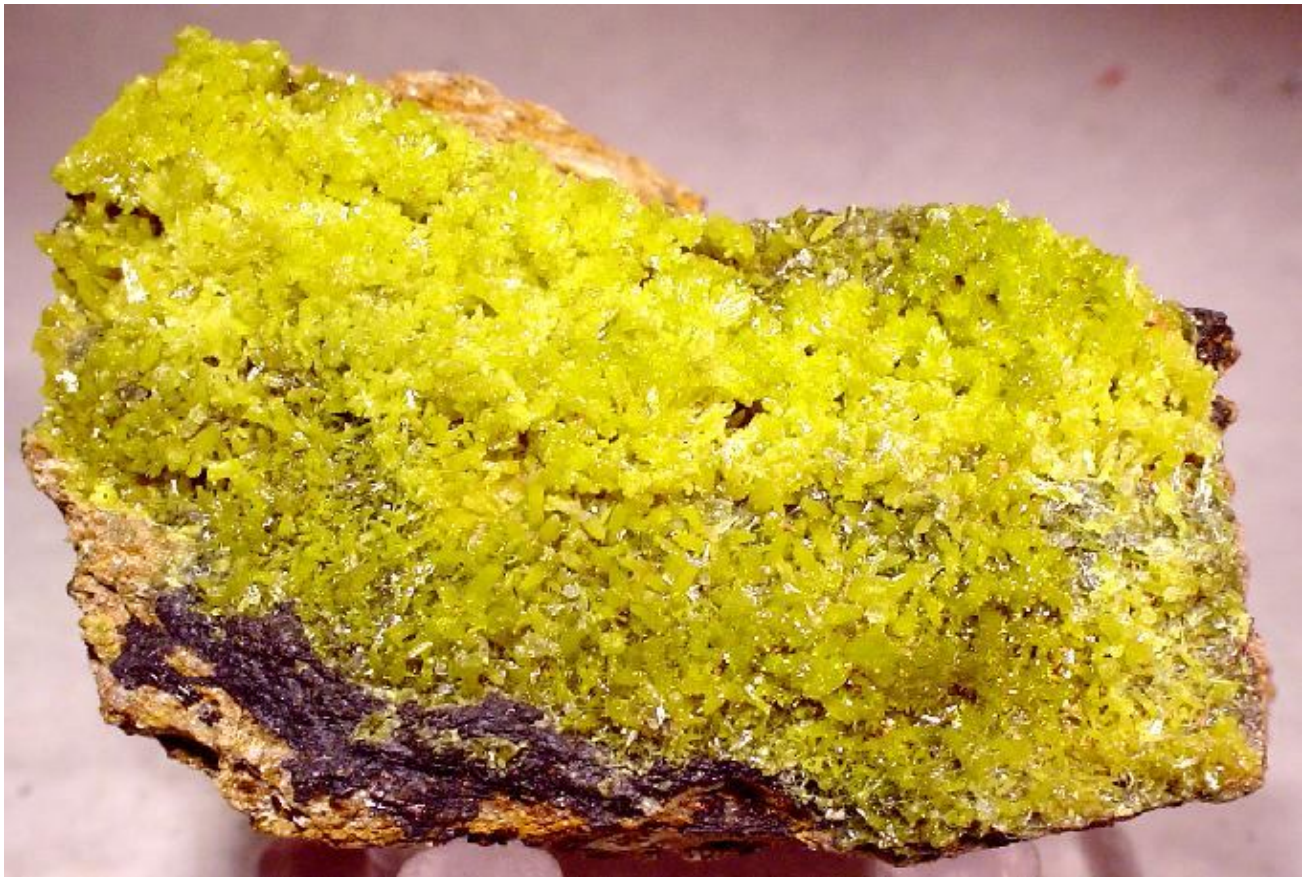
Name:	purpurite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	(Mn,Fe)(PO ₄) Hydrous Copper Arsenate		
	Color(s):	purple, pink to purplish red, magenta, black, sometimes brownish		
	Hardness:	4 - 4.5	SpecGrav:	3.2 - 3.4
	Fracture:	uneven	Cleavage:	complete
	Crystal:	orthorhombic (very small crystals, usually appears as a thin scale, always inter grown)		
	Environment:	present in pegmatites		
	Association:	heterosite		
	Locals:	Sweden California, USA France Namibia Austrailia		
	Misc:	From the Latin purpureus - "purple red."		






Name:	pyromorphite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	Pb5(PO4)3Cl Lead Chloro-Phosphate		
	Color(s):	yellow, yellow-white, greenish, Streak: pale-yellow,greenish-yellow		
	Hardness:	3.5 - 4.0	SpecGrav:	6.7 - 7.1
	Fracture:	uneven	Cleavage:	none
	Crystal:	hexagonal		
	Envronment:	alteration zone in hydrothermal deposits		
	Association:	mimetite wulfenite, galena, cerussite		
	Locals:	Mexico British Columbia Austrailia Idaho/ USA		
	Misc:	soluble in nitric acid, it has a high index of refraction, name comes form the Greek phrase "pyro morph" meaning "fire formed", it was observed by the Greeks that it would recrystallize from a melt.		





Name:	roselite (wendellwilsonite **)				
	Class:	Phosphates/Arsenates/Vanadates			
	Chemistry:	Ca2 (Co,Mg) (AsO4)2 · 2 H2O			
	Color(s):	red, rose red, pink streak: light red			
	Hardness:	3.5			SpecGrav:
Fracture:	perfect	Cleavage:			
Crystal:	monoclinic - prismatic				
Environment:					
Association:					
Locals:	Canada Germany Morocco				
Misc:	Named after Gustave Rose (1798-1873), professor on mineralogy at the University of Berlin, Germany. wendellwilsonite** is a solution series member which differs only in the ratio of magnesium to cobalt.				






Name:	scholzite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	CaZn2(PO4)2 * 2H2O Hydros Calcium Zinc Phosphate		
	Color(s):	white, clear, yellowish streak:white		
	Hardness:	3 - 4	SpecGrav:	3.11
	Fracture:	conchoidal	Cleavage:	incomplete
	Crystal:	Orthorhombic (tabular, acicular, radiating)		
	Envronment:	phosphate pegmatites		
	Association:	phosphophyllite, hopeite, parahopeite, tarbuttite		
	Locals:	Germany Australia Zambia		
Misc:				






Name:	skutterudite			
Class:	Phosphates/Arsenates/Vanadates			
Chemistry:	(Co,Ni)As ₃ Mixed Cobalt-Nickel Arsenate			
Color(s):	metallic gray, tin-white streak:black			
Hardness:	5.5 - 6.0	SpecGrav:	6.1 - 6.9	
Fracture:	conchoidal	Cleavage:	distinct	
Crystal:	isometric (crystals are often octahedral, cubic, and dodecahedral)			
Envrnment:	Formed in hydrothermal veins, medium to high temperature			
Association:	arsenopyrite, silver, bismuth, calcite			
Locals:	Iran Germany Canada Morocco Colorado, Arizona, USA			
Misc:	The name is derived from one of its more famous locals, Skutterrud, Norway. Fumes smell strongly of garlic when heated. (not recommended)			





Copyright: G. Fraccaro

Name:	strengite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	Fe(PO4) € 2 H2O		
	Color(s):	colorless, white, yellow, pink, violet		
	Hardness:	3-4	SpecGrav:	
	Fracture:	conchoidal	Cleavage:	perfect
	Crystal:	Orthorhombic; tabular, radiating fibrous, and sometimes as crusts		
	Environment:	in phosphorus containing limonite, and phosphate pegmatites		
	Association:	phosphosiderite, strunzite, beraunite, vabelite, vivianite		
	Locals:	Germany / Portugal / Sweden / CA., Al., USA /		
	Misc:	name after a German mineralogist, J. A. Streng (1830-1897).		






Name:	svanbergite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	Sr Al3 (PO4) (SO4) (OH)6		
	Color(s):	colorless, yellow-orange, reddish brown, pink Streak: white		
	Hardness:	5	SpecGrav:	3.22
	Fracture:		Cleavage:	distinct
	Crystal:	Trigonal - Hexagonal Scalenohedra		
	Environment:			
	Association:			
	Locals:	Australia Canada China England Sweeden Ca., USA		
Misc:				






Name:	torbernite			
Class:	Phosphates/Arsenates/Vanadates			
Chemistry:	$\text{Cu}(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 10\text{H}_2\text{O}$ hydrated copper uranium phosphate			
Color(s):	green, yellowish-green, Streak: white			
Hardness:	2 - 2.5	SpecGrav:	3.3	
Fracture:	uneven	Cleavage:	perfect 1 direction	
Crystal:	tetragonal (often micaceous - tabular plates)			
Environment:	in pegmatites, hydrothermal veins, and some sedimentary deposits. It is an oxidation product of other uranium minerals.			
Association:	uranite, autunite			
Locals:	England Australia Germany France Zaire Mexico North Carolina/USA			
Misc:	is not fluorescent, it is radio active, named for the Swedish mineralogist Torbern Olaf Bergman.			





Name:	vanadinite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	Pb5(VO4)3Cl Lead ChloroVanadate		
	Color(s):	orange, red, Streak: yellow-white		
	Hardness:	2.75 - 3.0	SpecGrav:	6.7 - 7.2
	Fracture:	conchoidal	Cleavage:	none
	Crystal:	Hexagonal (sometimes hallow)		
	Envronment:	Secondary mineral develops in hydrothermal replacement deposits		
	Association:	galena, wulfenite, barite, pyromorphyte		
	Locals:	Morocco Zambia Mexico Arizona, New Mexico/ USA		
	Misc:	soluble in nitric acid, an arsenic rich variety is also known as endlichite, name is from the element vanadium		




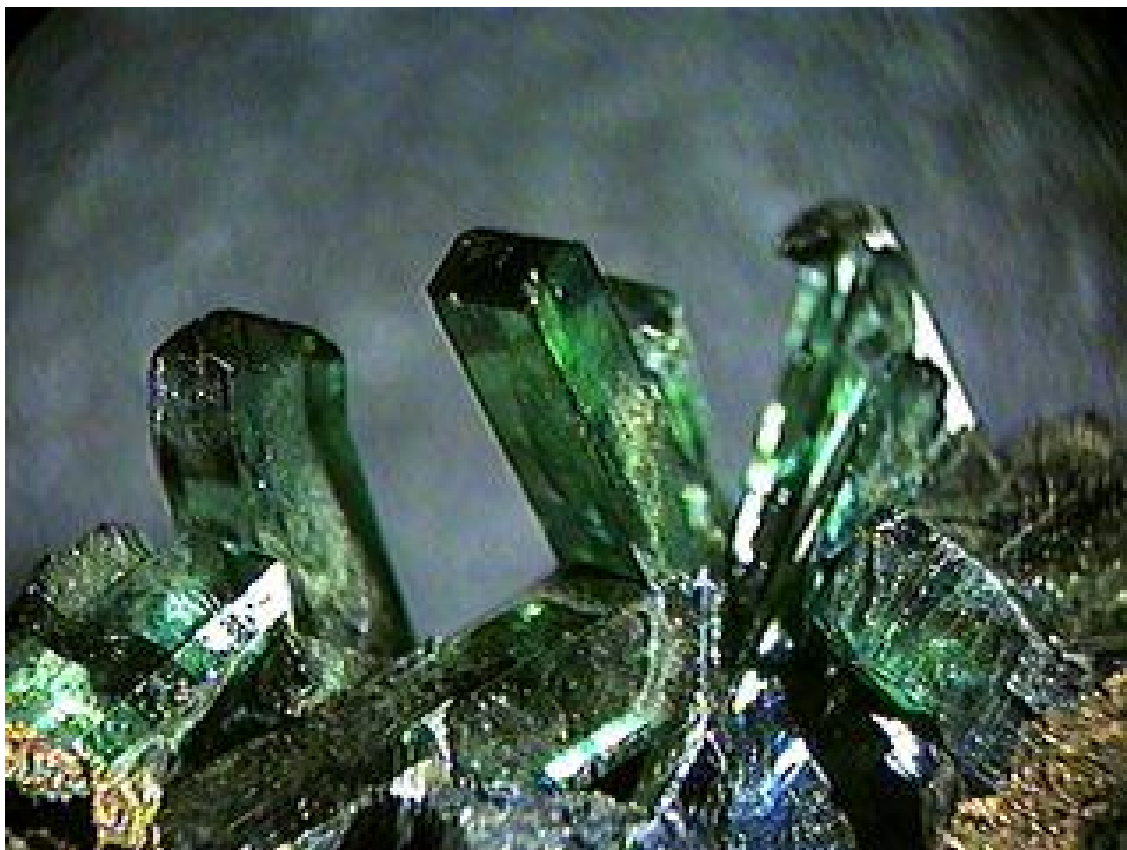


Name:	variscite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	Al PO4 · 2(H2O)		
	Color(s):	light green streak: white		
	Hardness:	3.5	SpecGrav:	2.54
	Fracture:	brittle	Cleavage:	good
	Crystal:	Monoclinic - Prismatic		
	Environment:	in hydrothermal replacement deposits		
	Association:	apatite, chalcedony, limonite		
	Locals:	Utah, Nv., USA		
	Misc:	Thee name is derived from Variscia and ncient district in Germany.		






Name:	vivianite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	Fe3(PO4)3Cl Iron Chloro-phosphate		
	Color(s):	blue, green, gray-black, Streak: lt. blue, white, brown		
	Hardness:	1.5 - 2.0	SpecGrav:	2.58 - 2.7
	Fracture:	splintery	Cleavage:	perfect
	Crystal:	monoclinic (prismatic) sometimes crystals appear bent		
	Envronment:	principally in disseminated hydrothermal replacement deposits		
	Association:	muscovite, sphalerite, quartz, pyrite, pyrrhotite, siderite		
	Locals:	Bavaria/Germany New Jersey, Colorado, Utah/USA Brazil		
	Misc:	soluble in HCl or HNO3, turns opaque and darker on exposure to light, named after J.G. Vivian, English Mineralogist		





Name:	wardite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	NaAl3(PO4)2(OH)4€2H2O Hydrous Sodium Aluminum Phosphate		
	Color(s):	blue-green, white, colorless		
	Hardness:	5	SpecGrav:	2.76
	Fracture:		Cleavage:	1 perfect
	Crystal:	Tetragonal - crystals often pyramidal, sometimes striated, sometimes fibrous or aggregates.		
	Environment:	found in pegmatites, and phosphate-rich sedimentary rocks		
	Association:	variscite, vivianite, lazulite, apatite, amblygonite		
	Locals:	France UT., S.D., CA., N.H., USA Brazil		
Misc:	Named for Henry Ward.			





Name:	wavellite			
	Class:	Phosphates/Arsenates/Vanadates		
	Chemistry:	Al3(PO4)2(OH)3 * 5 H2O Hydrous basic aluminum phosphate		
	Color(s):	green, yellow, white, brown, Streak: white		
	Hardness:	3.5 - 4	SpecGrav:	2.3 - 2.4
	Fracture:	conchoidal	Cleavage:	perfect 1, good 2
	Crystal:	Orthorhombic (usually radial fibrous -globular)		
	Environment:	alteration zone in contact metamorphic rocks, and alteration zone of epithermal veins		
	Association:	quartz, muscovite, limonite, turquoise		
	Locals:	Brazil Bolivia England Arkansas, Colorado, Pennsylvania/USA		
	Misc:	The name is after William Wavell, the English physician who discovered it.		





<http://www.theimage.com/mineral/class.htm>